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Report 11369
December 1998

GenCorp
Aerojet

Integrated Advanced Microwave Sounding Unit-A (AMSU-A)

Performance Verification Report

METSAT AMSU-A2 Antenna Drive Subsystem

P/N 1331200-2, S/N 107

Contract No. NAS 5-32314
CDRL 208

Submitted to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

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AMSU-A VERIFICATION TEST REPORT

TEST ITEM:	METSAT AMSU- A2 ANTENNA DRIVE SUBSYSTEM PART OF P/N: 1331200-2 SERIAL NUMBER: 107
LEVEL OF ASSEMBLY:	SUBASSEMBLY AND COMPLETE INSTRUMENT ASSEMBLY
TYPE HARDWARE:	FLIGHT
VERIFICATION: PROCEDURE NO.	AE-26002/2E

TEST DATE:

ASSEMBLIES:	START DATE:	19 October 1998
SUBSYSTEM:	START DATE:	27 October 1998

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ITEM

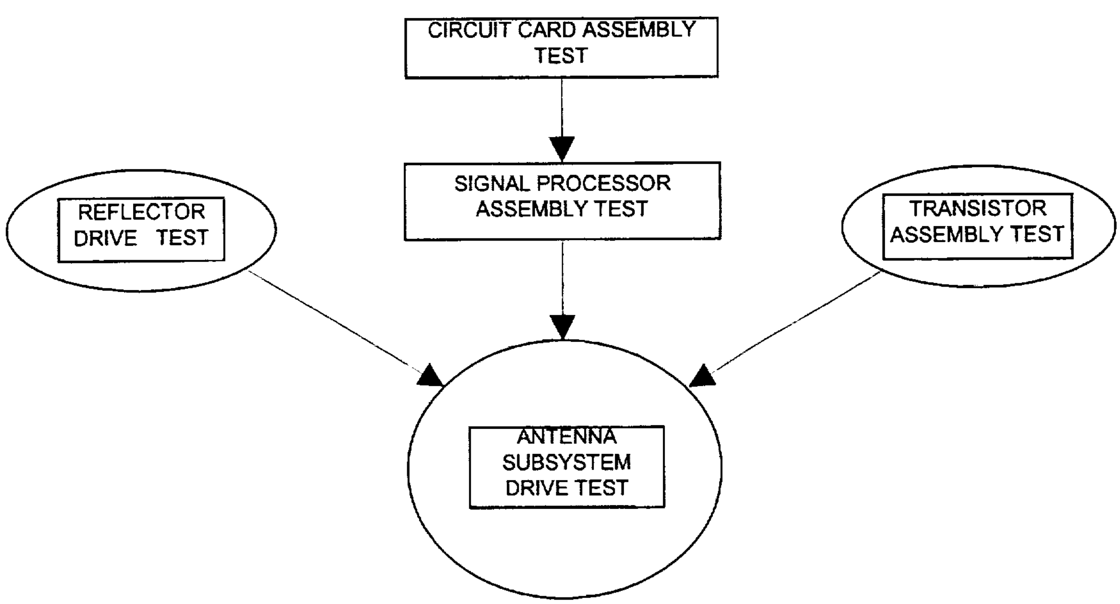
1.0 INTRODUCTION

An antenna drive subsystem test was performed on the METSAT AMSU-A2 S/N 107 instrument. The objective of the test was to demonstrate compliance with applicable paragraphs of AMSU-A specifications S-480-80. Tests were conducted at both the subassembly and instrument level.

2.0 SUMMARY

The antenna drive subsystem of the METSAT AMSU-A2 S/N 107, P/N 1331200-2, completed acceptance testing per AES Test Procedure AE-26002/2E. The test included: Scan Motion and Jitter, Pulse Load Bus Peak Current and Rise Time, Resolver Reading and Position Error, Gain/ Phase Margin, and Operational Gain Margin.

The drive motor and electronic circuitry were also tested at the component level. The drive motor test includes: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The electronic circuitry was tested at the Circuit Card Assembly (CCA) level of production; each test exercised all circuit functions. The transistor assembly was tested during the W3 cable assembly (1356946-1) test. Refer to Figure 1 for test flow.



Antenna Subsystem and Subsystem Component Test Flow
Figure 1.

The antenna drive subsystem satisfactorily passed all of the performance requirements. There were no failures in any of the antenna drive components during subsystem testing.

The results of the subsystem and component level testing are discussed in more detail in the following sections:

3.0 TEST CONFIGURATION

The ***Reflector/ Compensator Drive Motor Tests*** confirm the operability of the motor under test. The test configuration includes, the motor, motor shaft, bearings, and a supporting housing.

The ***Circuit Card Assembly (CCA) Tests*** confirm the operability of each CCA. Each test includes the CCA under test, electronic test fixtures, and the necessary loads.

A segment of the ***Signal Processor Tests*** ensures the scan drive electronics are functioning properly prior to it's assembly into the instrument. The test configuration includes:

- Timing and Control CCA
- Scan Control Interface CCA
- Relay Driver and Current Monitor CCA
- Interface Converter CCA
- Resolver Data Isolator CCA
- R/D Converter CCA
- Motor Driver CCA
- Test fixture and cabling to simulate the spacecraft bus interface
- Test fixture and cabling to interrogate and analyze positional data
- Test motor and inertia wheel

The ***Transistor Assembly Test*** verifies the correct wiring of the transistor assembly and associated cabling. Test configuration includes the CKT 1000 (continuity and Hi-Pot tester), and test fixtures.

The Antenna Drive Subsystem Tests:

- Are configured with the same motor control CCA's used in the signal processor test, interconnecting wiring, the power transistor assembly, and the drive assembly with reflector.
- The antenna drive subsystem components were all installed in the instrument when the subsystem test was performed.
- DC power for the motor control circuit cards was provided by a DC/DC converter simulator P/N: 1359322-1. The simulator operates on 120VAC facility supplied power. The power for the reflector motor drive circuits however was provided directly by the STE 28V Bus power supply.

4.0 TEST SETUP

The antenna drive subsystem tests are performed during system integration. During system integration testing, the instrument is proven electrically safe via ground isolation, and power distribution checks. Next, the communication link is exercised to ensure commands are received and interpreted correctly. The Antenna Drive Subsystem Test is then performed.

5.0 TEST RESULTS

The Antenna Drive Subsystem components designated for use in the METSAT AMSU-A2 S/N 107 instrument are shown in Table 1. During preliminary testing of these components (in preparation for the antenna drive subsystem test), only one anomally was detected; the failure description and disposition is listed below:

- ***Reflector Drive Motor*** – DCMC rejected the instrument during one of the customer inspection points. The discrepancy related to a mechanical junction: "...nut doesn't have 1½ tp 3 threads protruding." Structural analysis proved the assembly to be structurally sound. Bonding material was placed on the nut to insure locking. A drawing change was initiated to allow the use of a "thinner" washer (still structurally sound) if this anomally appeared again on later units.

CCA	S/N
Resolver Data Isolator Assembly	F32
Interface Converter Assembly	F31
Scan Motor Driver Assembly	F04
Compensator Driver Assembly	F05
R/D Converter/ Oscillator Assembly	F07

OTHER	S/N
Reflector Drive Motor	F06
Compensator Drive Motor	F08
Signal Processor	F03
Transistor Assembly (W3 cable)	N/A

TABLE 1
METSAT AMSU-A2 S/N 107 Antenna Subsystem Component S/N Designations

All other components designated for use in the METSAT AMSU-A2 S/N 107 instrument (pertaining to the scan drive circuitry) passed on the first time through component testing.

5.1 ANTENNA AND COMPENSATOR DRIVE ASSEMBLY

The tests performed on these units are: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The Motor Commutation and Resolver Operation tests are performed both pre and post-vibration.

Starting Torque
The starting torque test is performed on the rotating segment of the drive assembly to verify the torque associated with bearing friction. Both the reflector drive motor (F06) and the compensator drive motor (F08) passed the starting torque test at ambient temperature as well as at the colder plateaus.

Motor Commutation Test
This test is performed to determine the commutation characteristics of the motor under test. Both the reflector drive motor (F06) and the compensator drive motor (F08) passed both pre- and post-vibration tests without incident.

Resolver Operation/ No-Load Speed Test
This test is performed to verify resolver operation as well as speed characteristics and back electromotive force of the motor. Both the reflector drive motor (F06) and the compensator drive motor (F08) passed the resolver operation/ no-load speed test both pre- and post-vibration tests without incident.

Random Vibration

Vibration testing was successfully completed; both motors passed the vibration requirements without incident. Both the reflector drive motor (F06) and the compensator drive motor (F08) passed the pre- and post-vibration electronic tests as well as the post-vibration visual inspection without incident. During a visual inspection, it was noted that the resolver shaft nut on the Reflector Drive Assembly did not have enough exposed threads. An ECN was generated to change the drawing to add epoxy at this connection. The epoxy was added prior to the vibration test.

5.2 CIRCUIT CARD ASSEMBLIES

Test procedures were prepared for each motor control circuit card; document revision status is controlled by reference in the shop order. The cards were individually tested to the procedures and results were recorded on data sheets found in Appendix A. The following list indexes the CCA Test Data Sheets:

- *Appendix A1 .... Resolver Data Isolator Assembly*
- *Appendix A2 .... Interface Converter Assembly*
- *Appendix A3 .... Motor Driver Assembly*
- *Appendix A4 .... R/D Converter/ Oscillator Assembly*

All circuit card assemblies passed testing the first time through. The assembly build shop orders contain the part number and accept tag record of the test and select resistors.

5.3 SIGNAL PROCESSOR

For the first time, the entire antenna drive motor electronics is mated together. The test instrumentation commands and interrogates the electronics during this segment of testing. The instrumentation sends position commands to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The test motor (instrumentation) responds to the drive signal and feeds back positional data via resolver outputs. The instrumentation then interrogates the Resolver Data Isolator CCA for position data. A comparison is made in the instrumentation between the position command sent and the actual position received. The pass/ fail indication is presented to the operator for test data sheet recording.

The signal processor assembly (F03) passed all scan drive tests.

5.4 TRANSISTOR ASSEMBLY

All transistor assemblies are tested along with their respective W3 cable. The cable is continuity, then hi-pot tested prior to attaching the transistor circuitry. Each transistor pair is exercised validating the turn on voltage, current drawn, and cable wiring as well.

Several wiring errors were noted during manufacturing checks prior to testing. No errors were detected during the several testing phases of this assembly.

5.5 ANTENNA SUBSYSTEM DRIVE TESTS

The antenna drive motor electronics mate with the instrument microprocessor for the first time during this segment of testing. The microprocessor sends position commands from the memory CCA to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The Reflector Drive Motor responds to the drive signals and feeds back positional data via the resolver outputs. The microprocessor then interrogates the Resolver Data Isolator CCA for position data.. The microprocessor in turn communicates with the spacecraft interface.

During segments of this test, positional data is monitored via a potentiometer attached to the shaft of the reflector drive assembly. This provides scan characteristic information in regard to overshoot, jitter, and beam position transition timing.

The remaining paragraphs in this section discuss tests that ensures the instrument complies with specific operating parameters. Prior to conducting these tests there is a series of preliminary checks that are run to select component values that customize the operating parameters of the instrument. These checks perform the following functions:

- Program "on board" memory with Beam Position Pointing Angles
- Adjust for peak Motor Current Limits
- Observe Preliminary Scan Dynamics
- Identify Mechanical Resonant Frequencies

Beam Position Pointing Angles are calculated from Nadir pointing direction which is determined on the antenna range. The instrument's EPROMs (EPROMs for testing; PROMs for final configuration) are programmed to reflect the position commands. The initial programming may require fine tuning; fine tuning is determined during the remaining segments of the test procedure.

Motor Current Limits were adjusted, via selecting "test and select" resistors, to comply with the specification requirement; less than 2 amp peak current.

Preliminary Scan Dynamics looked good; transition times, overshoot and jitter were all acceptable at the sampled pointing directions (5).

The ***Mechanical Resonant Frequencies*** were identified; notch filters were calculated and installed to compensate for these resonant frequencies.

5.5.1 SCAN MOTION AND JITTER

In this test, the antenna position was measured in a series of five 8-sec full scans. The measurement was made with a 1-turn test potentiometer temporarily affixed to the rear end of the motor shaft. A Dynamic Signal Analyzer (DSA) was connected to the pot wiper to record the antenna position data. Five scans were captured and stored on the AMSU-A2 Test Data File disc. One representative waveform is presented in Appendix B1.

Each 3.33 degrees scene step was expanded and checked for a 42 msec max step time, and the 158 msec integration period. Expanded waveforms were plotted and are presented in Appendix B2 thru B30. All of the scene steps meet the step response requirement for transition time, overshoot, and jitter.

Slew periods to the cold and warm calibration stations were measured and met requirements. A time of 0.21 sec is allocated for the 35.0 degree slew to cold cal, and 0.40 sec for the 96.67 degree slew to warm cal. Calibration station jitter was less than the $\pm$ 5 % maximum permitted. Expanded waveforms were plotted and are presented in Appendix B31 thru B34. The waveforms are also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix B35

5.5.2 PULSE LOAD BUS PEAK CURRENT AND RISE TIME

The Pulse Load pulse load bus peak current and the rate of change of current were measured. The peak current must be less than 2A at any beam position along the scan. Peak current along the scan is 1.92A. The current rate of change while transitioning from one beam position to the next (including the transition to the cold calibration and warm calibration targets) should be greater than 70 microseconds. A random 3.33° step was selected; the transition to the next step was 1.56 ms. The transition to the warm cal position start and stop was significantly longer than the required 70 ms; 1.95 and 4.29 ms respectively.

The peak bus current was measured across the entire scan and met the requirement. The full scan waveform was plotted and is presented in Appendix C1. The waveform is also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix C2

5.5.3 RESOLVER READING AND POSITION ERROR

The 14-bit command position word is stored in the "on-board" memory and is read to the motor drive circuitry under microprocessor program control. The microprocessor also reads the resolver output at each of the thirty scene stations, and at the cold and warm calibration positions. The readings are made at the start of integration (LOOK 1), and halfway into the integration period (LOOK 2). The resolver data is sent to the spacecraft interface for subsequent transmission to the STE.

The purpose of this portion of the test is to demonstrate that the antenna is meeting beam pointing requirements.

If the antenna is out of the pointing tolerance of > ± 10 counts at LOOK 1 or > ± 5 counts at LOOK 2 , the EPROM is reprogrammed to bring the pointing direction to within the prescribe tolerances. A copy of the STE computer print out showing the pointing direction is shown in Figure 2.

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
1	6724	6724	6724	0	0
2	6572	6572	6574	0	2
3	6420	6420	6422	0	2
4	6269	6268	6270	-1	1
5	6117	6116	6117	-1	0
6	5965	5964	5966	-1	1
7	5814	5814	5818	0	4
8	5662	5662	5665	0	3
9	5510	5510	5513	0	3
10	5359	5358	5362	-1	3
11	5207	5207	5209	0	2
12	5055	5054	5057	-1	2
13	4904	4904	4906	0	2
14	4752	4751	4753	-1	1
15	4600	4600	4603	0	3
16	4449	4449	4452	0	3

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
17	4297	4297	4299	0	2
18	4145	4145	4147	0	2
19	3994	3994	3997	0	3
20	3842	3842	3844	0	2
21	3690	3689	3691	-1	1
22	3539	3538	3539	-1	0
23	3387	3386	3387	-1	0
24	3235	3234	3236	-1	1
25	3084	3083	3086	-1	2
26	2932	2932	2935	0	3
27	2780	2779	2782	-1	2
28	2629	2628	2630	-1	1
29	2477	2476	2478	-1	1
30	2325	2325	2327	0	2
CC 1	732	725	725	-2	-2
WC	12717	12710	12709	-2	-1

* Difference between Command and Actual

Figure 2. Beam Position Pointing Directions and Error Calculation

5.5.4 GAIN/PHASE MARGIN

A gain/phase margin test was performed on the antenna drive subsystem. The test was performed by obtaining a Bode plot of the control loop and measuring the gain at 180° phase differential and the phase margin at the 0db crossover point.

The Dynamic Signal Analyzer (DSA) was used to make the measurement operating in the swept sine mode. Three separate Bode plots were made on the antenna and the gain and phase margins were determined from each plot. The gain margin measured was 12.1 db (average of three) and the phase margin measured was 65.06 degrees (average of three). These margins exceed the specification requirements of 12 db and 25 degrees and therefore are acceptable. The three Bode waveforms were plotted and are presented in Appendix D1 thru D3. The waveforms are also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix D4.

5.5.5 OPERATIONAL GAIN MARGIN

An operational gain margin test was performed on the instrument three times. This test consists of increasing the gain of the control loop until oscillation occurs. The gain increase and frequency of oscillation are measured. An increase in gain greater than 9 db is required; the frequency of oscillation is an observation.

A 50K pot was connected in series with the R58 feedback resistor on amplifier AR8. The resistance of the test pot was slowly added to the feedback resistor while observing the reflector for oscillations.

The reflector begins to produce an audible sound as gain is increased. The following added resistance values are calculated to have the following gain margins:

Resistance	Gain
42.14	9.04 db
43.06	9.16 db
42.26	9.05 db

The first mode mechanical resonance of the shaft and reflector is about 73 Hz as shown in the power spectrum. The power spectrum waveform was plotted and is presented in Appendix E1. The waveform is also stored on the AMSU-A2 Test Data File disc. The test data sheet is presented in Appendix E2.

6.0 CONCLUSION

Based on the test results, it can be concluded that the METSAT AMSU-A2 S/N 107 antenna drive subsystem meets the AMSU-A specification requirements.

7.0 TEST DATA

Test data for the AMSU-A2 S/N 107 obtained in the antenna drive subsystem test is attached. Data sheet number and type of test is shown in the following Appendix Index.

APPENDIX INDEX

Appendix A1

Resolver Data Isolator Test Data Sheet

TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 4/14/97
S/N: F32
1334972-1

6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	5.00	± 0.25	P
+5 V (U)	5.01	± 0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.21	100 max	P
+5 V (U)	328	400 max	P

Steps 3 and 4:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.41	150 max	P
+5 V (U)	11.87	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (μsec)	Limits (μsec)	Pass/Fail
15.0	14.2	± 3.0	P

TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments:
NONE

Conducted by: Dennis Lau 4/14/97
Test Engineer Date

Verified by: 4-14-97
Quality Control Inspector Date

Approved by: 4/14/97
DCMC Date

Appendix A2

Interface Converter Test Data Sheet

TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 8/18/97
CCA S/N: F31
1331697-1

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	5.02	+5V± 0.05	P
+15V (I)	15.01	+15V± 0.15	P
-15V (I)	−14.98	-15V± 0.15	P
+5V (I)	5.02	+5V± 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	86.35	70 - 110	P
+5V (I)	3.36	1.5 - 5.5	P
+15V (I)	17.65	15 - 23	P
-15V (I)	20.37	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.48	40 - 70	P
+5V (I)	23.94	18 - 30	P
+15V (I)	17.65	15 - 23	P
-15V (I)	20.37	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	+0.07	0.0 ±0.15	P
AR2	+0.03	0.0 ±2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

WmHummel 9-10-97

± 0.00015
± 0.00060
± 0.00030

Step 1:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	+0.00007	P
00000000000001	00000000000000	-0.00061	-0.000679	P
00000000000010	00000000000000	-0.00122	-0.001340	P
00000000000011	00000000000000	-0.00184	-0.001952	P
00000000000100	00000000000000	-0.00245	-0.002537	P
00000000001000	00000000000000	-0.00490 *	-0.005115	P
00000000010000	00000000000000	-0.00979 *	-0.010180	P
00000000100000	00000000000000	-0.01958 *	-0.020304	P
00000001000000	00000000000000	-0.03917 *	-0.040554	P
00000010000000	00000000000000	-0.07834 *	-0.081050	P
00000100000000	00000000000000	-0.15667 *	-0.16203	P
00001000000000	00000000000000	-0.31334 *	-0.32404	P
00010000000000	00000000000000	-0.62669 *	-0.64813	P
00100000000000	00000000000000	-1.25338 *	-1.2964	P
01000000000000	00000000000000	-2.50675 *	-2.5929	P
10000000000000	00000000000000	-5.01350 *	-5.1359	P

* Tolerance on output voltage is ± 10%

WmHummel 9-10-97

± 0.00015
± 0.00060
± 0.00030

Step 2:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output* Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	+0.000061	P
00000000000000	00000000000001	0.00061	+0.000670	P
00000000000000	00000000000010	0.00122	+0.001317	P
00000000000000	00000000000011	0.00184	+0.001937	P
00000000000000	00000000000100	0.00245	+0.002584	P
00000000000000	00000000001000	0.00490 *	+0.005115	P
00000000000000	00000000010000	0.00979 *	+0.010205	P
00000000000000	00000000100000	0.01958 *	+0.020330	P
00000000000000	00000001000000	0.03917 *	+0.040576	P
00000000000000	00000010000000	0.07834 *	+0.081070	P
00000000000000	00000100000000	0.15667 *	+0.16213	P
00000000000000	00001000000000	0.31334 *	+0.32424	P
00000000000000	00010000000000	0.62669 *	+0.64844	P
00000000000000	00100000000000	1.25338 *	+1.2964	P
00000000000000	01000000000000	2.50675 *	+2.5927	P
00000000000000	10000000000000	-5.01350 *	-5.1359	P

* Tolerance on output voltage is ± 10%

TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe Function

Step 1: Strobe Low

	Pass/Fail
No E11 Change with Input CP Changes	P

Step 2: Strobe High

	Pass/Fail
E11 Change with Input CP Changes	P

6.13.7.6 Amplifier Gain

	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
E11	0.32424	-	P
E10	3.5631	-	P
E10 Voltage / E11 Voltage	11.0	10.7 - 11.3	P

6.13.7.7 Ground Isolation

	Measured Value (MΩ)	Limits (MΩ)	Pass/Fail
Pin 91 to Pin 7 DC Resistance	larger than 150MΩ	>20	P

Comments:
NONE

Conducted by: Dennis Lew — Test Engineer — Date 8/13/97

Verified by: [signature] 7A 190 — Quality Control Inspector — Date OCT 10 '97

Approved by: [signature] — DCMC — Date 10/14/97

Appendix A3

Motor Drivers Test Data Sheets

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F04
Date: 4/17/97
1331694-4

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.17mV	0.0 ±1 mVdc
6	1.03mV	0.0 ±1 mVdc
8	1.07mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.16k
	E9-E10 (R52)	4.64k
	E11-E12 (R33)	3.16k
	E13-E14 (R53)	4.49k
	E15-E16 (R42)	3.16k
	E17-E18 (R54)	4.50 K

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3161FS
	R52	RNC55J4751FS
	R33	RNC55J3161FS
	R53	RNC55J4531FS
	R42	RNC55J3161FS
	R54	RNC55J4531FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	-0.05mV	0.0 ±1 mVdc	P
	E20	-0.08mV	0.0 ±1 mVdc	P
	E21	-0.06mV	0.0 ±1 mVdc	P

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	+5.00V	+5V±0.05Vdc	P
	52.5mA	70mAdc max	P
	+15.07V	+15V±0.15Vdc	P
	1.5mA	3.0mAdc max	P
	-14.98V	-15V±0.15Vdc	P
	18.6mA	25mAdc max	P
	28.01V	+28V±0.5Vdc	P
	5.6mA	8mAdc max	P
3	260mV	400mVdc max	P
4	41.2mA	50mAdc max	P
5	47.6mA	50mAdc max	P

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TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	282mV	400mVdc max	P
4	36.8mA	50mAdc max	P
5	39.8mA	50mAdc max	P

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
2	435mA	350-500mAdc	P

Comments:
NONE

Conducted by: [signature] Test Engineer (TA 269) Date 4/17/97

Verified by: [signature] Quality Control Inspector Date 04/28/97

Approved by: [signature] DCMC Date 4/29/97

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F05
Date: 4/17/97
1331694-4

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.29 mV	0.0 ±1 mVdc
6	1.23 mV	0.0 ±1 mVdc
8	1.12 mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.40k
	E9-E10 (R52)	5.50k
	E11-E12 (R33)	3.40k
	E13-E14 (R53)	5.22k
	E15-E16 (R42)	3.16k
	E17-E18 (R54)	4.56k

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3401FS
	R52	RNC55J5621FS
	R33	RNC55J3401FS
	R53	RNC55J5231FS
	R42	RNC55J3161FS
	R54	RNC55J4531FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	-0.06mV	0.0 ±1 mVdc	P
	E20	+0.02mV	0.0 ±1 mVdc	P
	E21	+0.01mV	0.0 ±1 mVdc	P

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	+5.01V	+5V±0.05Vdc	P
	49.4 mA	70mAdc max	P
	+15.07V	+15V±0.15Vdc	P
	1.5mA	3.0mAdc max	P
	-14.98V	-15V±0.15Vdc	P
	18.3mA	25mAdc max	P
	+28.03V	+28V±0.5Vdc	P
	5.6mA	8mAdc max	P
3	279 mV	400mVdc max	P
4	42.5mA	50mAdc max	P
5	27.3mA	50mAdc max	P

AE-26693A
10 Feb 97

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	268mV	400mVdc max	P
4	36.2mA	50mAdc max	P
5	39.7mA	50mAdc max	P

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
2	426mA	350-500mAdc	P

Comments: None

Conducted by: [signature] Test Engineer   Date 4/17/97

Verified by: [signature] Quality Control Inspector   Date 04/28/97

Approved by: [signature] DCMC   Date 4/29/97

Appendix A4

R/D Converter/ Oscillator Test Data Sheet

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 5/14/97
CCA S/N F 07
1337739-2

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06	0-1	P
-15	-0.28	-1 - 0	P
+5	0.06	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.02V	± 0.50	P
-15V (I)	-15.01V	± 0.50	P
+5V (I)	5.03V	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	31.96 mA	31.9 mA	20-40	P
-15	-36.74 mA	-36.46 mA	-30 - -50	P
+5	50.85 mA	50.79 mA	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.01V	± 0.50	P
-15V (I)	-14.97V	± 0.50	P
+5V (I)	5.02V	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1603 Hz	1550-1650 Hz	P
Duty Cycle	52 %	45-55 %	P
Output Voltage	8.04 VRMS	7.6-8.4 Vrms	P

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2	P	P
API 2/3	P	P
API 3/4	P	P
API 4/5	P	P
API 5/6	P	P
API 6/7	P	P
API 7/8	P	P
API 8/9	P	P
API 9/10	P	P
API 10/11	P	P
API 11/12	P	P
API 12/13	P	P
API 13/14	P	P
Converter Busy	P	P

Step 2: wmfummel 3-4-97 QC 16

~~PES-RS~~ RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation**	+1.7120	N/A	+1.7896	P
CCW Rotation**	-1.7120	N/A	-1.7896	P

* Signal level function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within ±10 percent of calculated value. The equation is as follow:

$$V = \pm 0.155 \left(\frac{R20}{R17}\right) \pm \frac{\cancel{23}\%}{10} \%$$

R20 = 59K
R17 = 5.11K

Plan 5/14/97

wmfummel 5-15-97 QC 229

6.5.7.5 Amplifier Gain

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	1.111 V	1.00 to1.30	P
PES = -0.300 Vdc	1.116 V	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
~~C~~CW Rotation	5.0V	4.5 to 5.5	P
CCW Rotation	0.12V	0.0 to 0.4	P

wmfummel 5-15-97 QC 229

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA -2 Assy	Pass/Fail
AR3 Notch	N/A	N/A	N/A	N/A
AR4 Notch		N/A	N/A	N/A
AR5 Notch	N/A	N/A	N/A	N/A

* Notch frequencies shall be within ±3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments: NONE

Note

This test shall be performed at the system level during antenna drive subsystem ~~level~~ testing.

QC 16

WMHummel
3-4-97

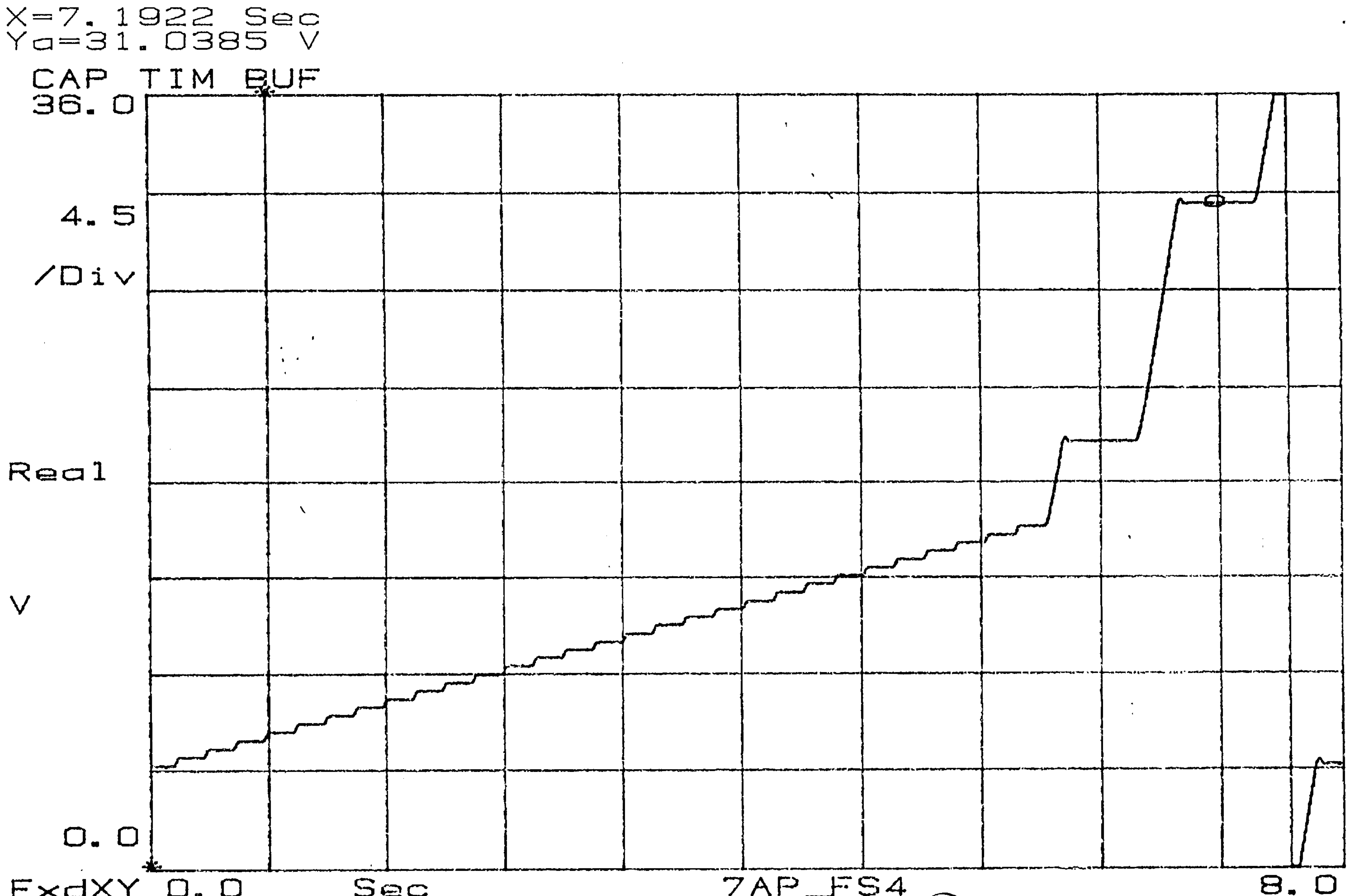
Conducted by: Dennis Lu 5/14/97
Test Engineer Date

Verified by: Judie Hervey 5/15/97
Quality Control Inspector Date

Approved by: [signature] 5/15/97
DCMC Date

Appendix B

Motor Scan Dynamics DSA Plots and Test Data Sheets



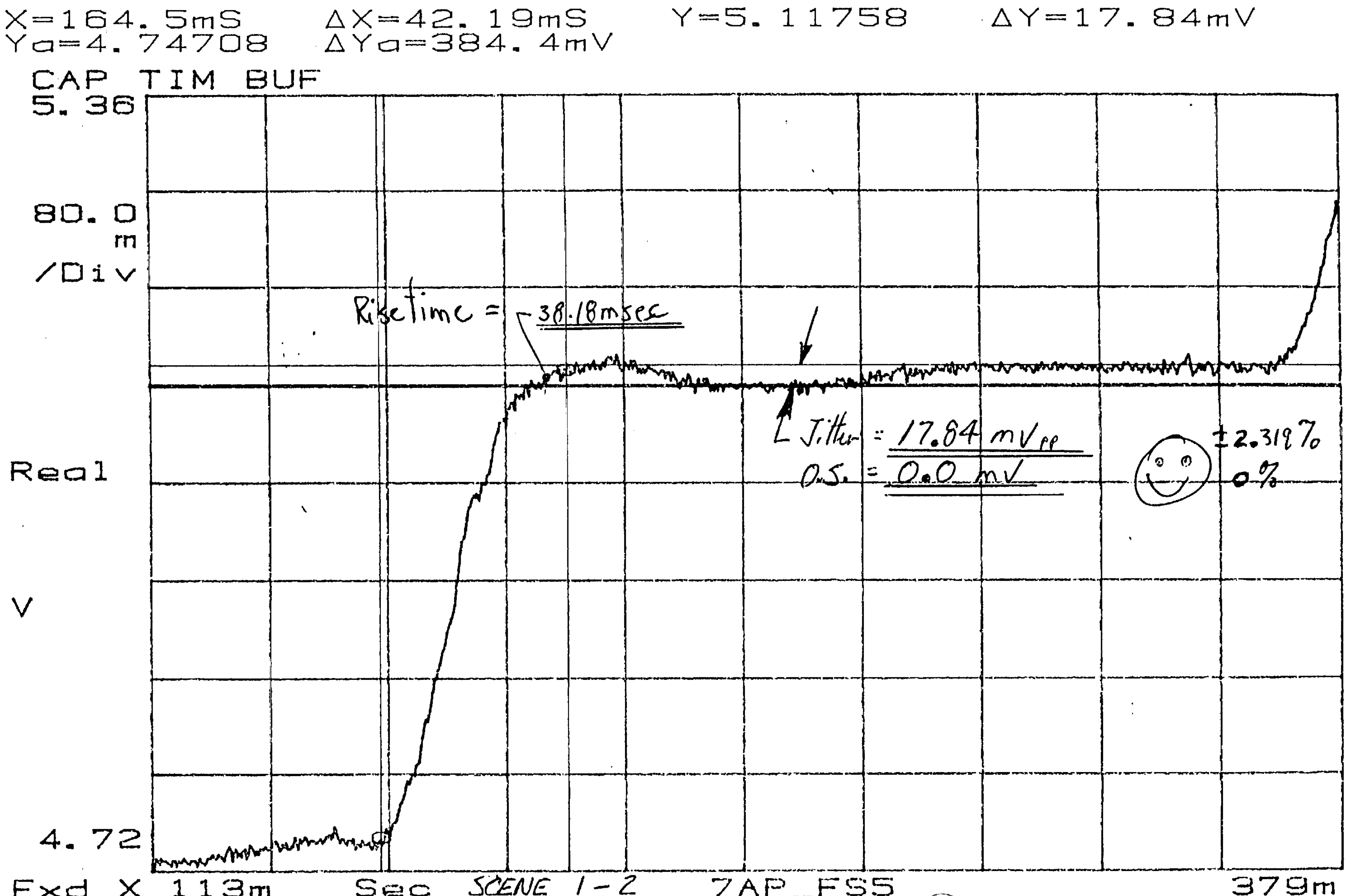
S/O: 335167 3.4.5.5

P/N: 133120D-2-1T SN: 107

Test Eng: AMSU B SEIT Date: 10-22-98

Quality: TA 268 OCT 27 '98

B1



SCENE 1-2 7AP_FS5

3.4.5.5

SCAN MOTION

P/N: 1331200-2-1T SN: 107

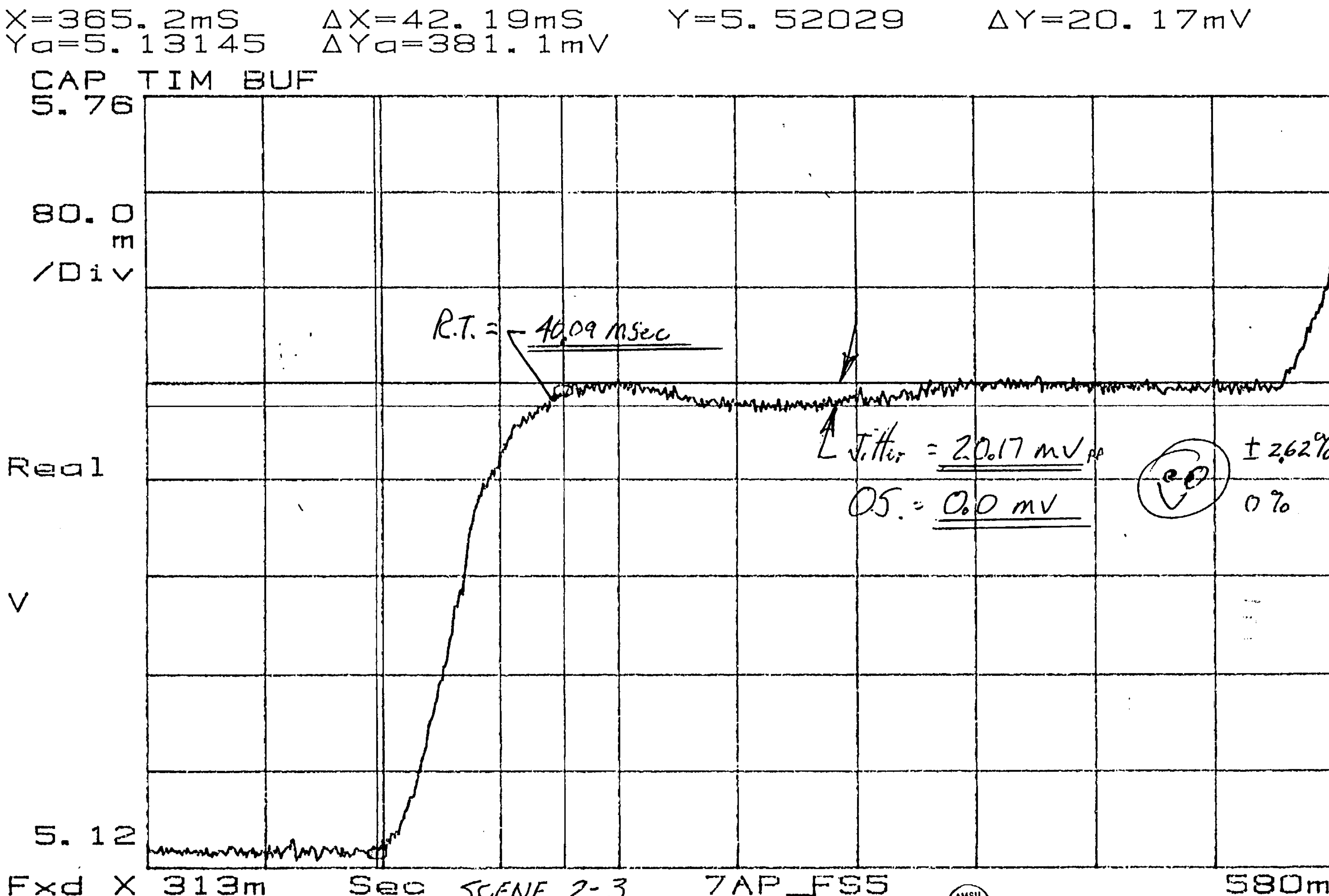
S/O: 335167

Test Eng: AMSU B BEIT

Quality: TA 260 OCT 27 '98

Date: 10-26-98

B2

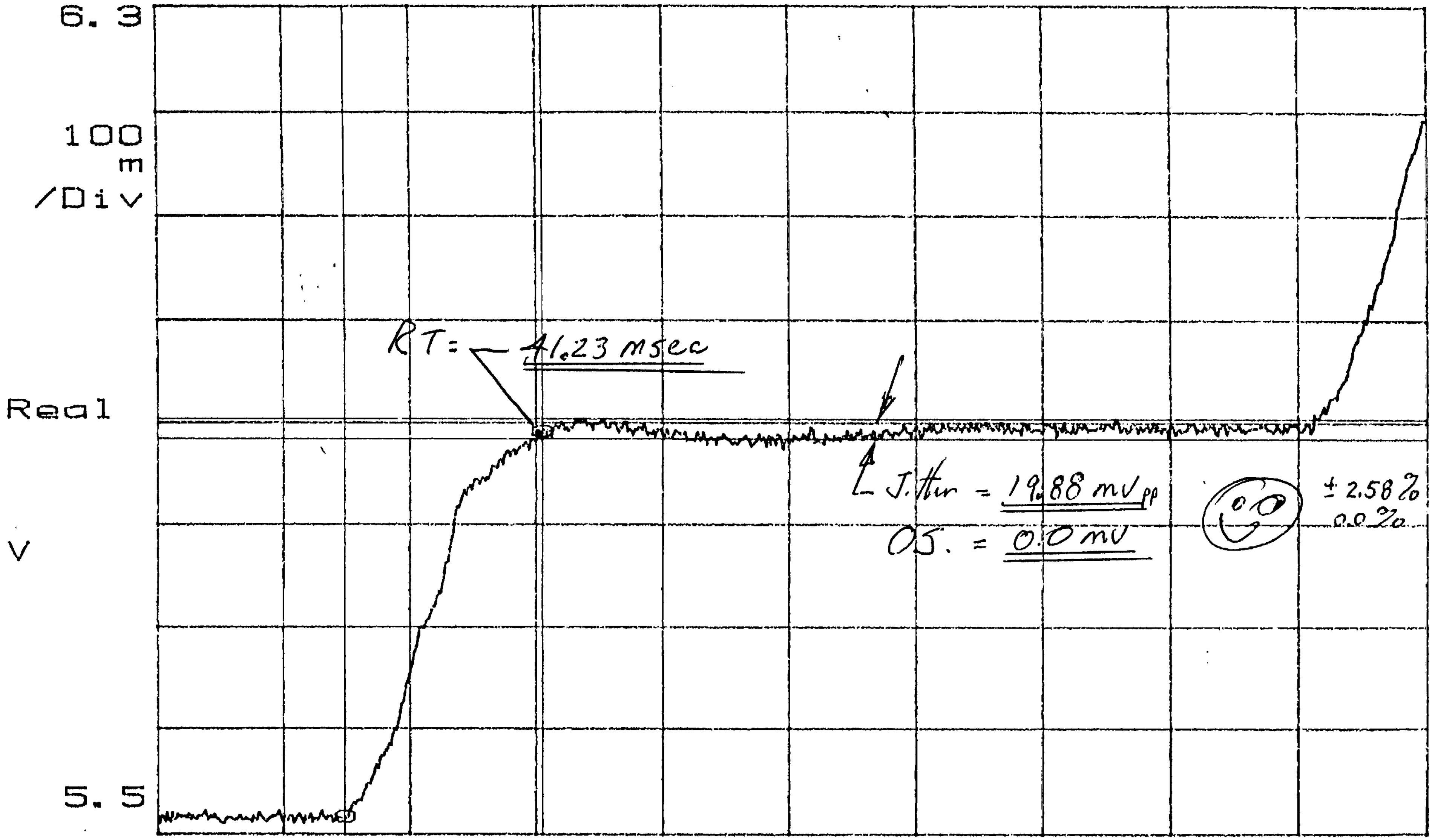


S/O: 335167
P/N: 1331200-2-1T SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B3

X=567.6mS ΔX=41.8mS Y=5.90339 ΔY=19.88mV
Ya=5.51582 ΔYa=374.6mV
CAP TIM BUF

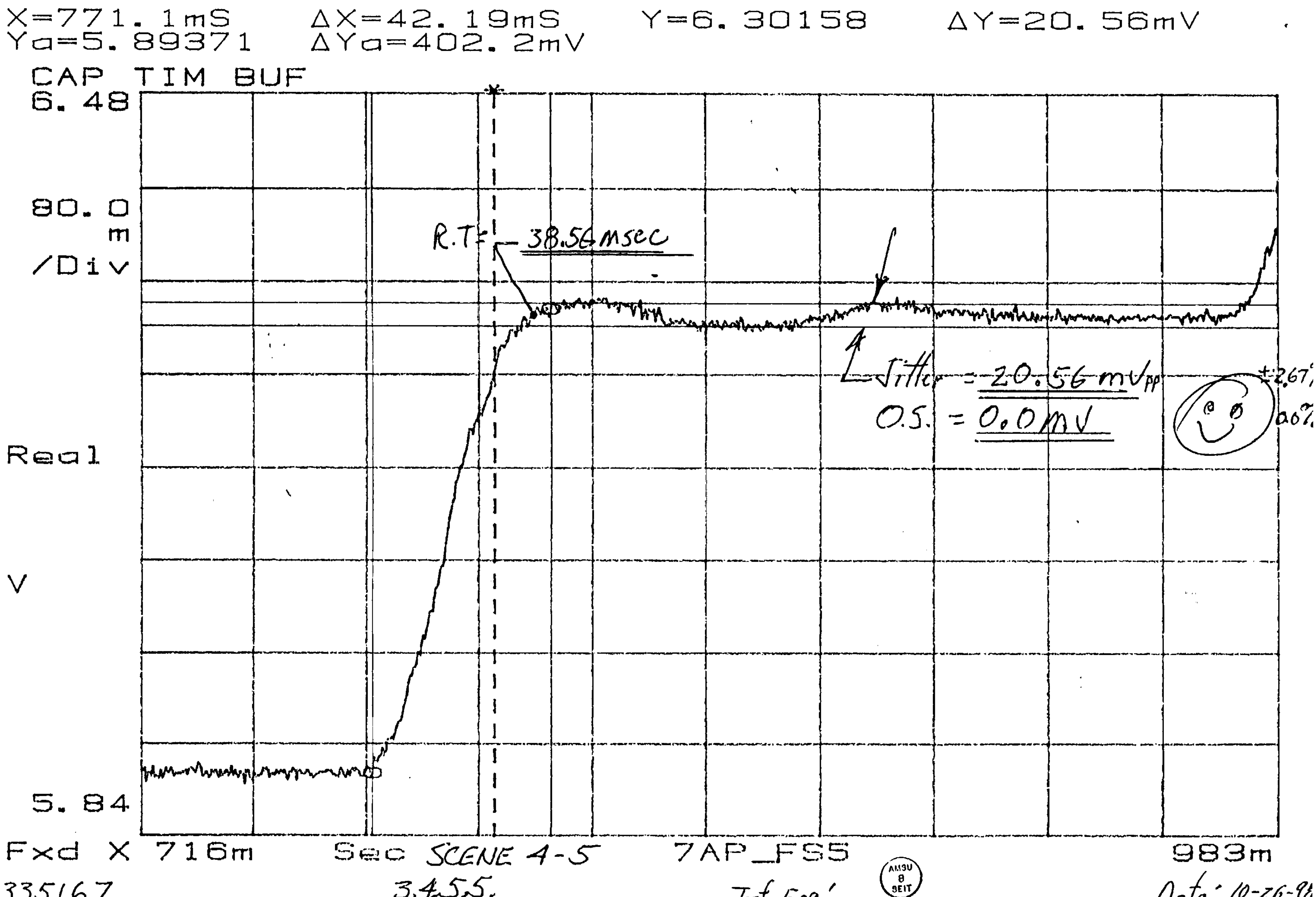


Fxd X 528m Sec SCENE 3-4 7AP_FS5 795m

S/O: 335167 34.5.5. Test Eng: AMSU B SEIT Date: 10-26-98

P/N: 1331200-2-1T SN: 107 Quality: 7A 268 OCT 27 '98

B4

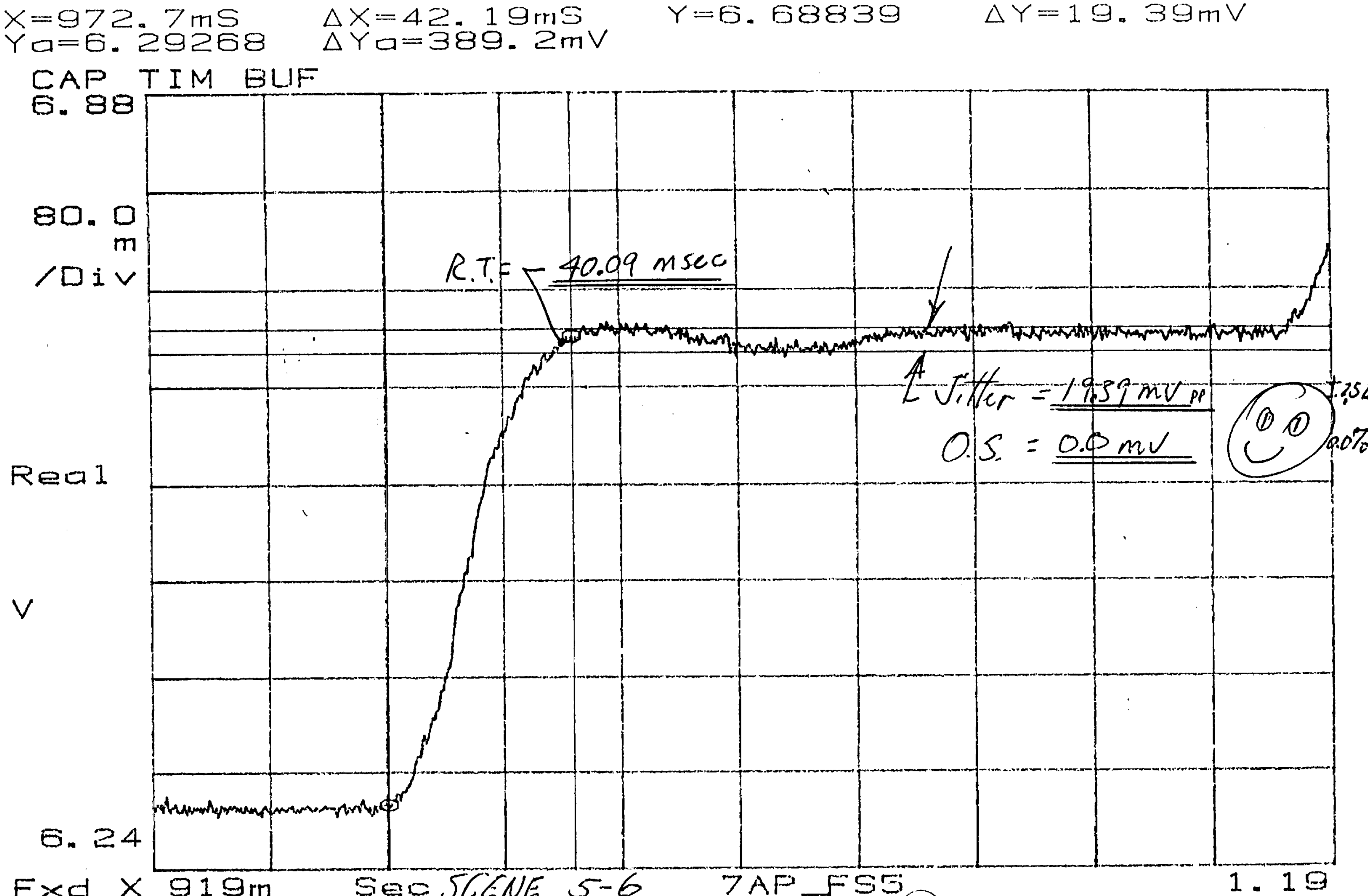


S/O: 335167

P/N: 1331200-2-1T SN: 107

Tst Eng': AM3U 8 SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98



SCENE 5-6 7AP_FS5

3,4,5,5

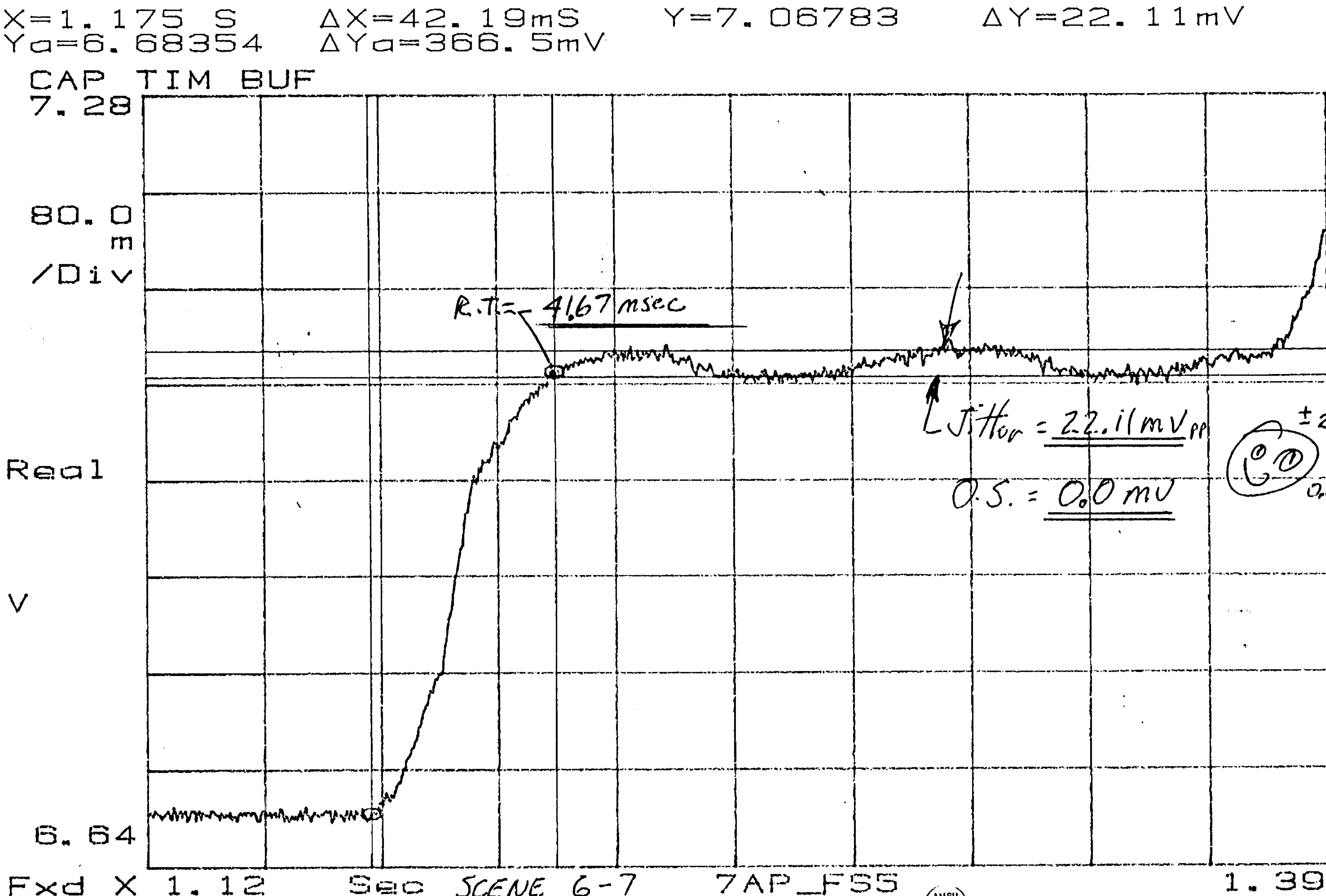
S/O: 335167

P/N: 1331200-2-1T SN: 107

Test Eng: AMSU B DEIT

Date: 10-26-98

Quality: 7A 268 OCT 27 '98



S/o: 335167

P/N: 1331200-2-1T SN: 107

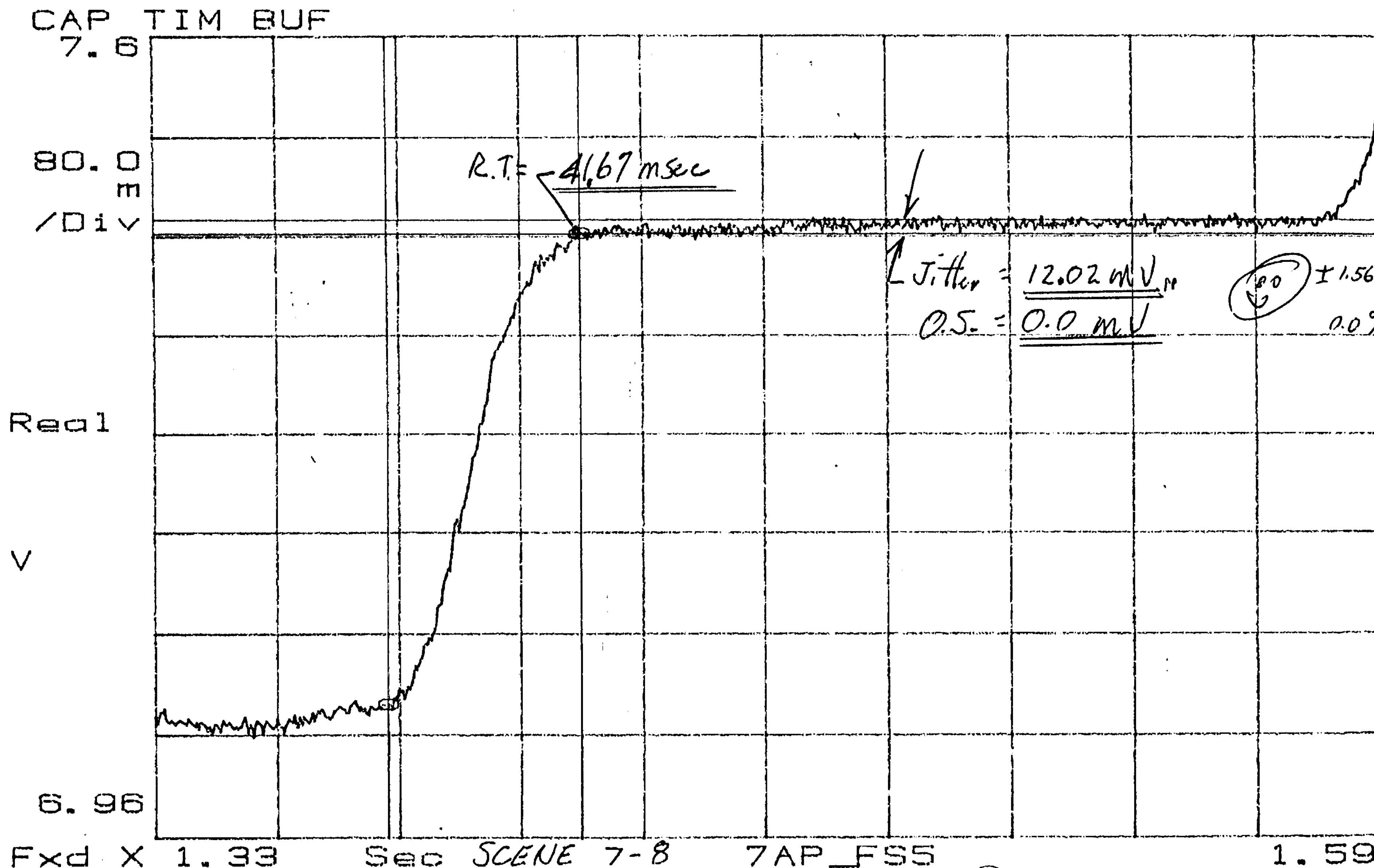
Test Eng: AMSU B SEIT

Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B7

X=1.377 S ΔX=42.19mS Y=7.45416 ΔY=12.02mV
Ya=7.06467 ΔYa=377.9mV



S/O: 335167 3.4.5.5.

P/N: 1331200-2-1T SN: 107

Test Eng: AMSU B BEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B8

X=1.58 S   ΔX=42.19mS   Y=7.82351   ΔY=8.921mV
Ya=7.45553   ΔYa=360.0mV

CAP TIM BUF

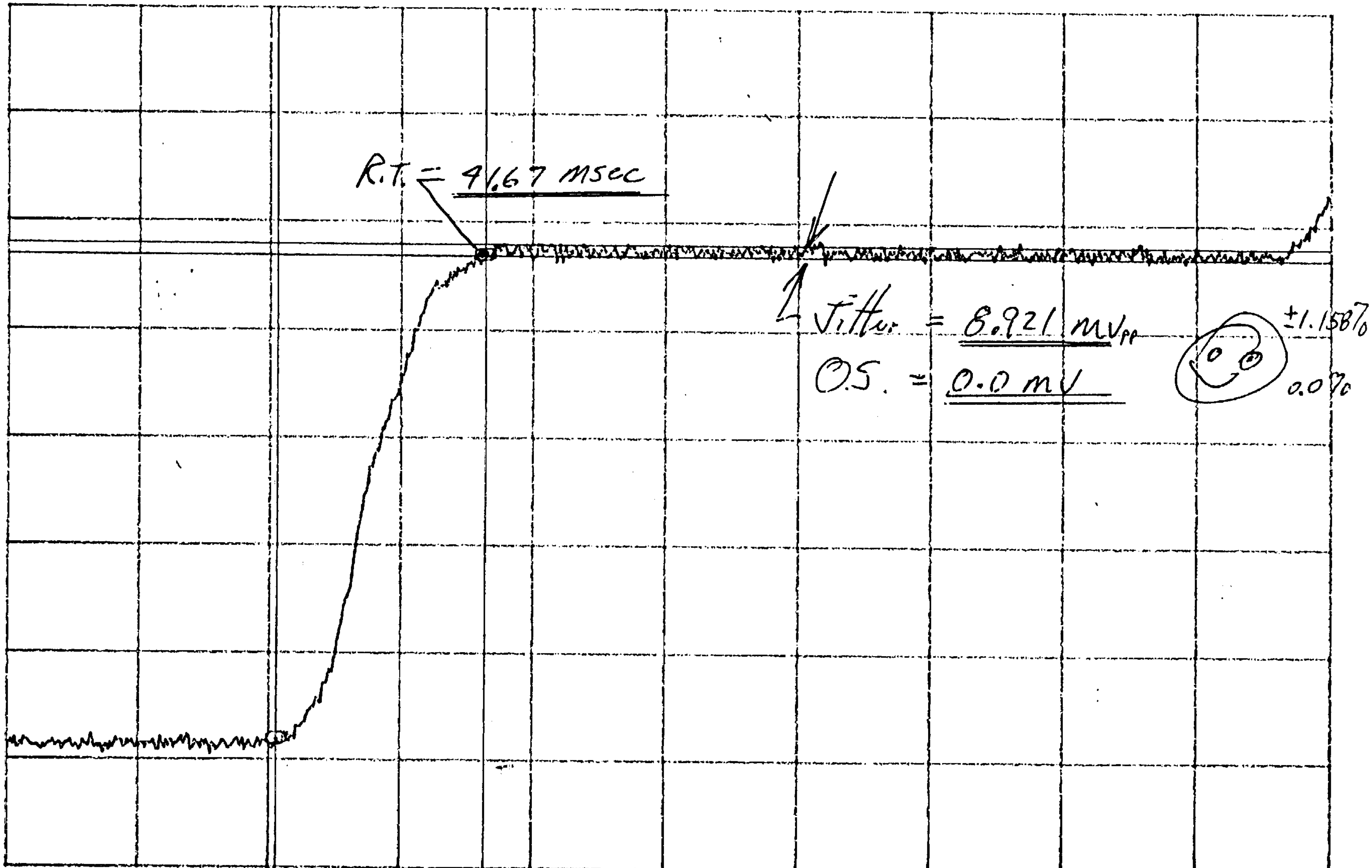
8.0

80.0 m /Div

Real

V

7.36



Fxd X 1.53   Sec SCENE 8-9   7AP_FS5   1.79

3.455

S/O: 33567

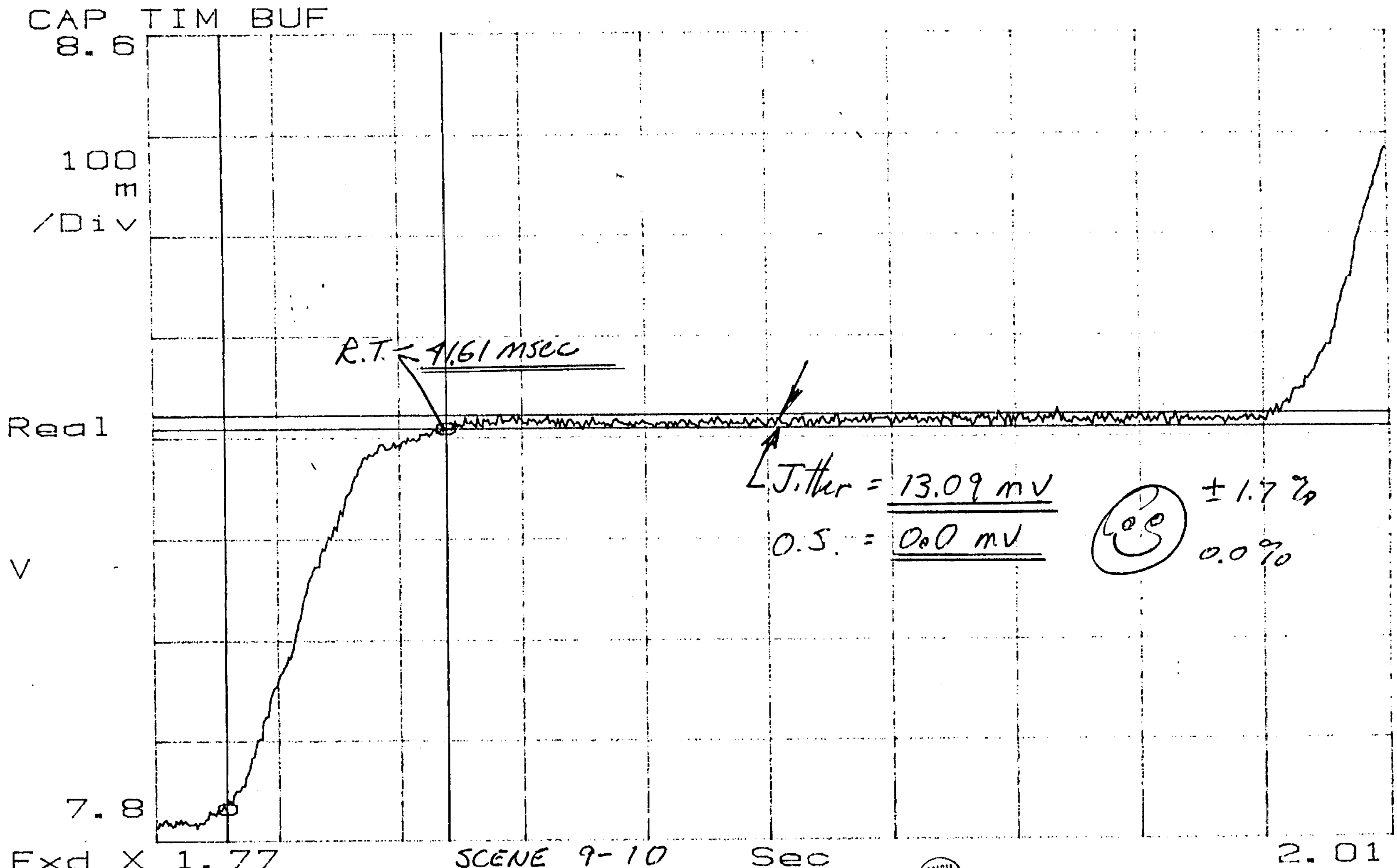
P/N: 133200-2-1T SN: 107

Test Eng: AMSU B 9EIT   Date: 10-26-98

Quality: 7A 268 OCT 27 '98

39

X=1.788 S ΔX=42.19mS Y=8.20824 ΔY=13.09mV
Ya=7.83179 ΔYa=376.3mV

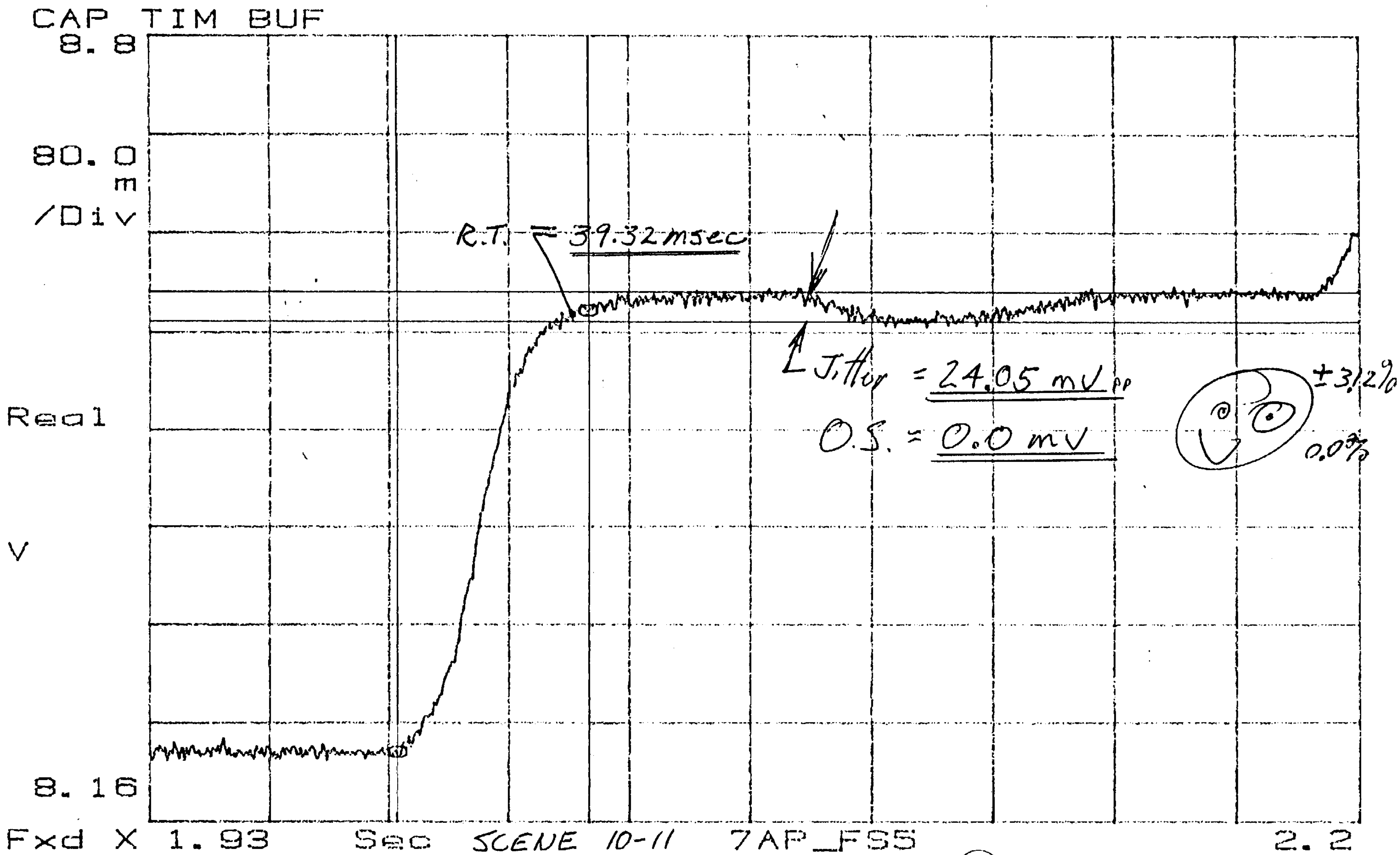


S/O: 335167 3.A.S.S. Test Eng: AMSU 8 GEIT Date: 10-26-98

P/N: 133/200-2-1T SN: 107 Quality: TA 268 OCT 29 '98

B10

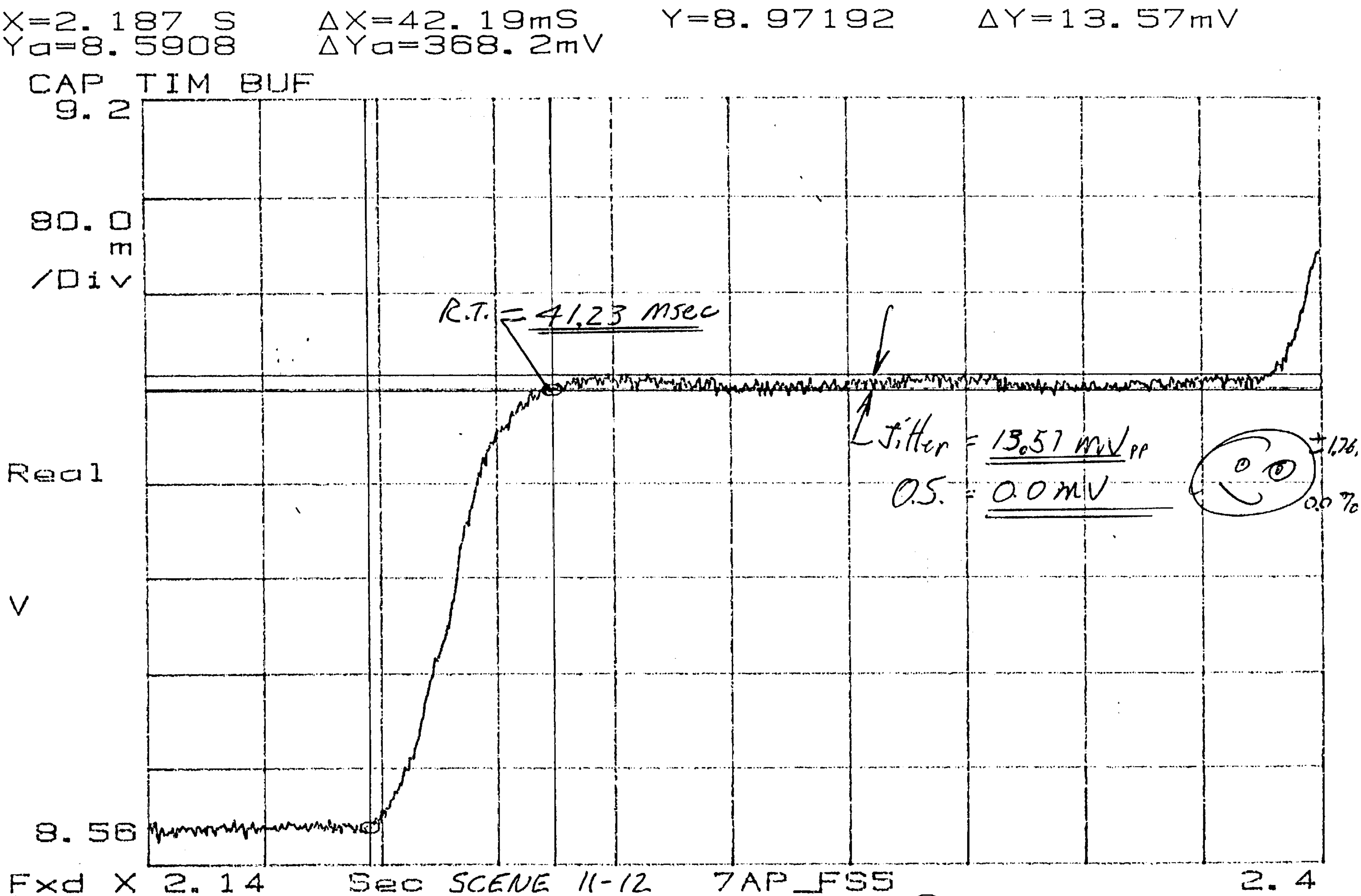
X=1.985 S ΔX=42.58mS Y=8.59326 ΔY=24.05mV
Ya=8.21616 ΔYa=361.7mV



S/O: 335167
P/N: 1331200-2-1T SN: 107

Test Eng: AMSU B BEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B11



3.4.5.5.

S/O: 335167

P/N: 133200-2-1T SN: 107

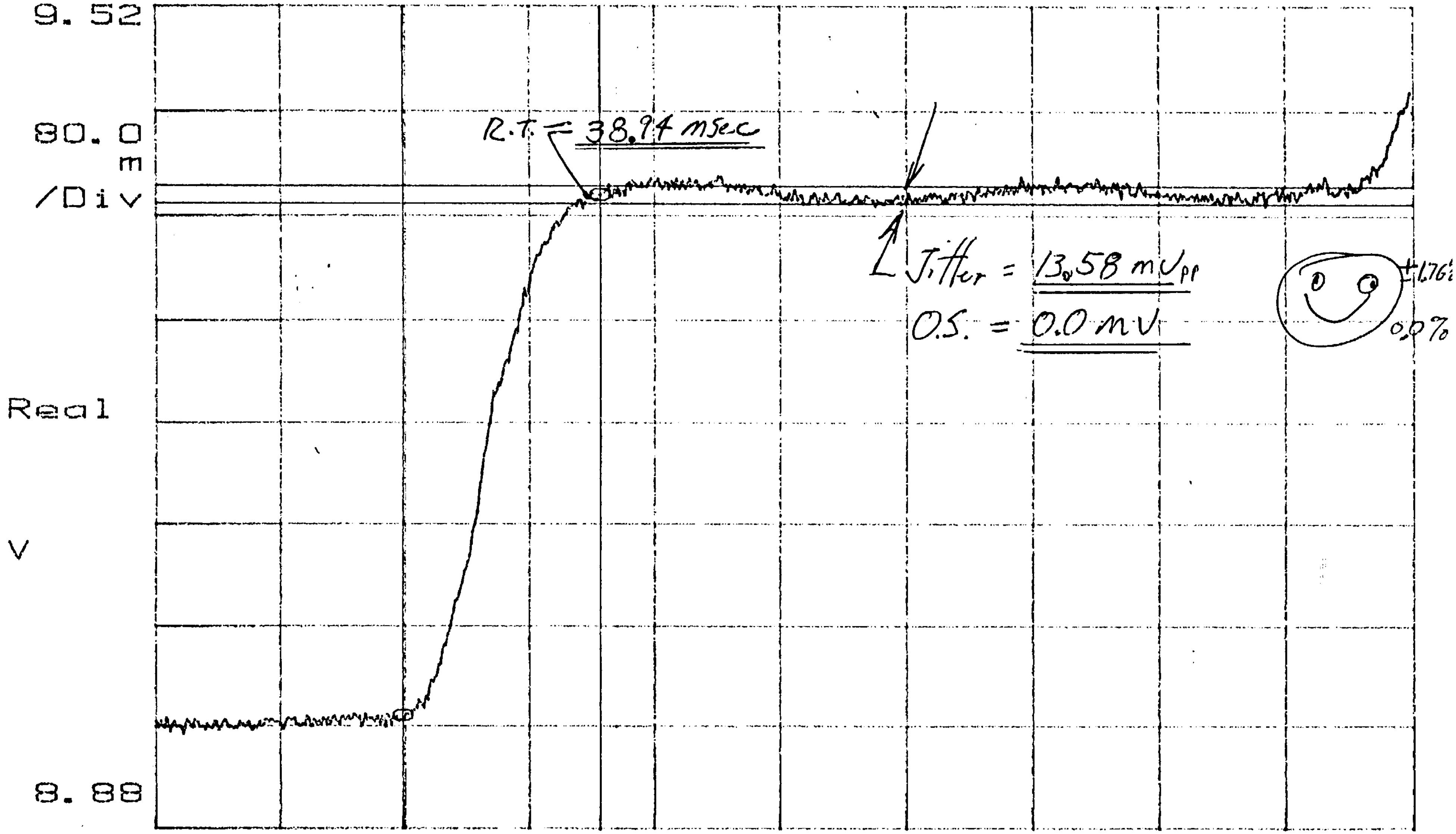
Test Eng: AMSU B SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B12

X=2.39 S ΔX=42.19mS Y=9.38308 ΔY=13.58mV
Ya=8.96869 ΔYa=407.1mV

CAP TIM BUF



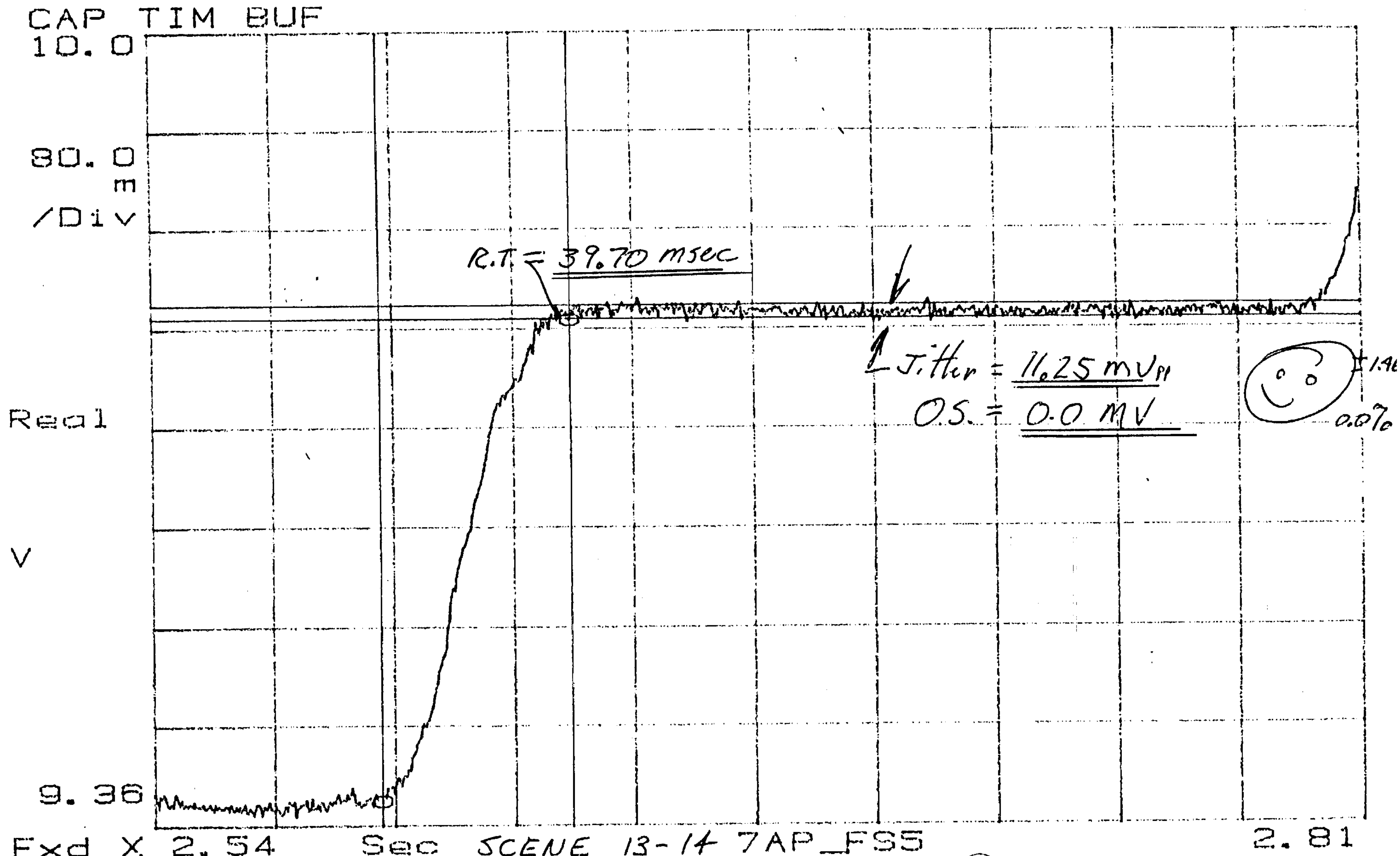
Fxd X 2.34 Sec SCENE 12-13 7AP_FS5 2.6

S/O: 335167 3.4.55. Test Eng: AMCU 8 SCIT Date: 10-26-98

P/N: 133/1200-2-1T SN: 107 Quality: 7A 268 OCT 27 '98

B13

X=2.593 S ΔX=42.19mS Y=9.77929 ΔY=11.25mV
Ya=9.37901 ΔYa=387.6mV



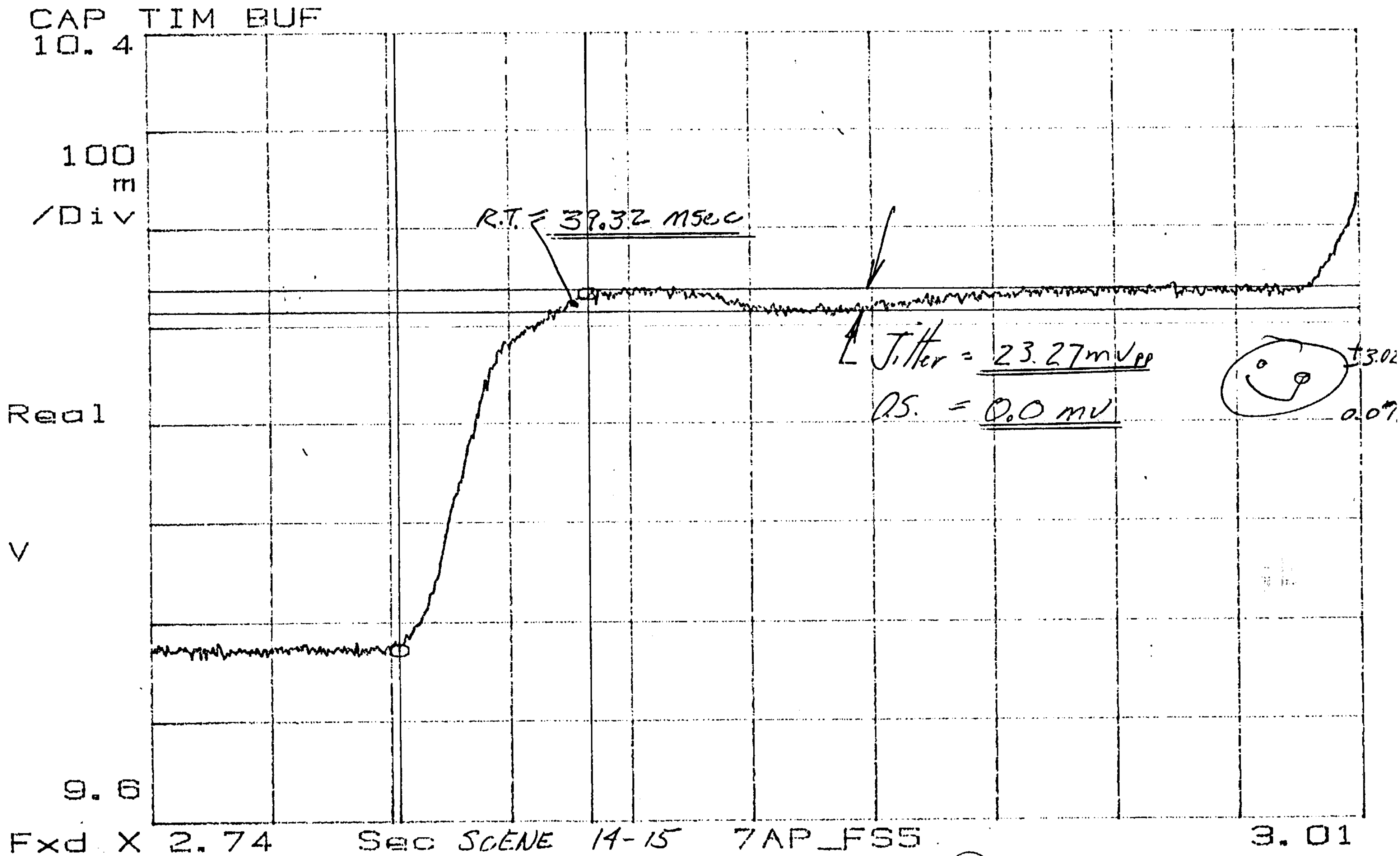
SCENE 13-14 7AP_FS5
3.4.55.

S/O: 335167
P/N: 133 1200-2-1T SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B14

X=2.799 S ΔX=42.19mS Y=10.1382 ΔY=23.27mV
Ya=9.77149 ΔYa=361.7mV



3.455.

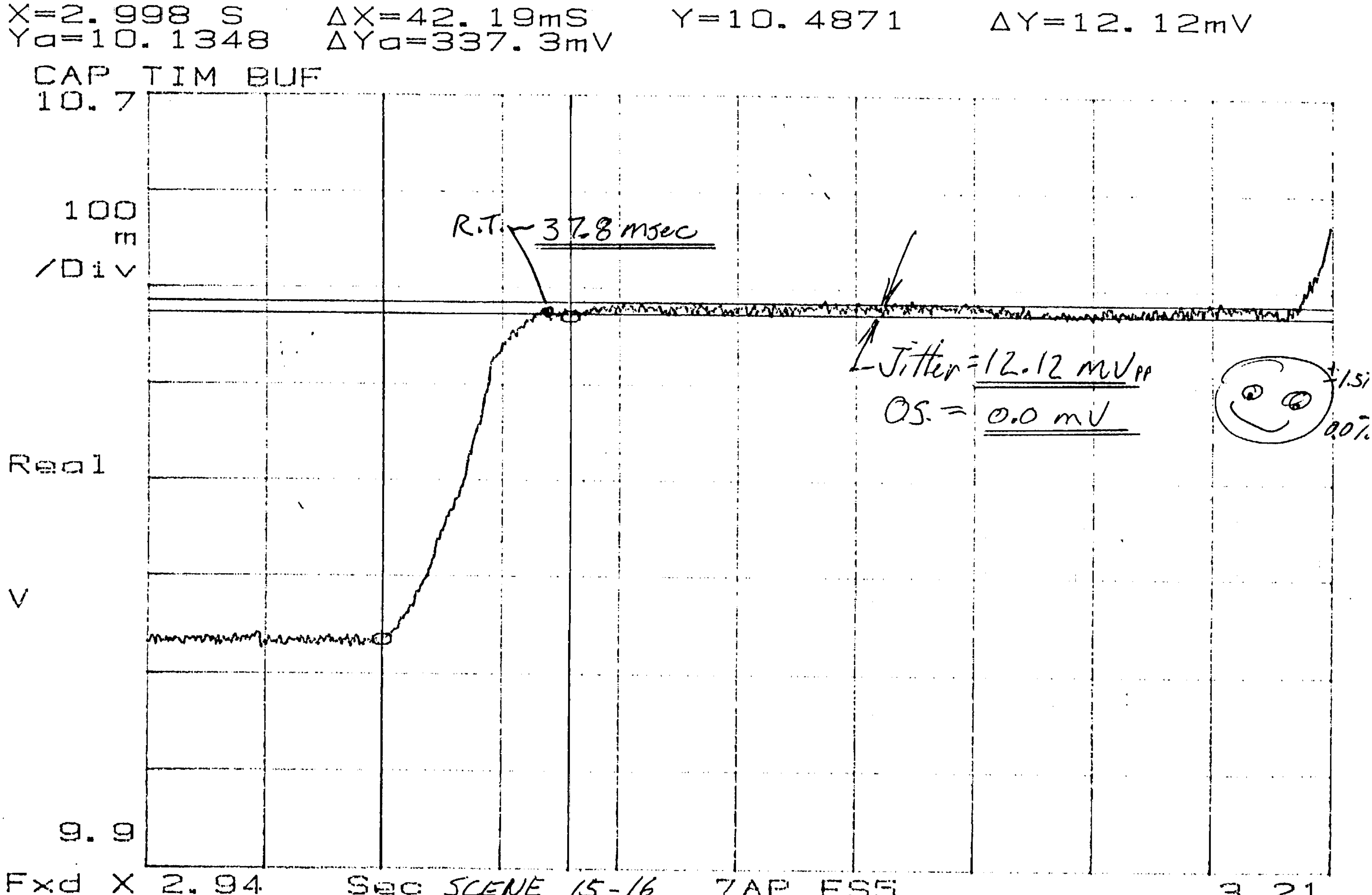
S/O: 335167

P/N: 133/200-2-1T S/N: 107

Test Eng: AMSU 8 SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

BIS



SCENE 15-16 7AP_FS5
3.4.5.5

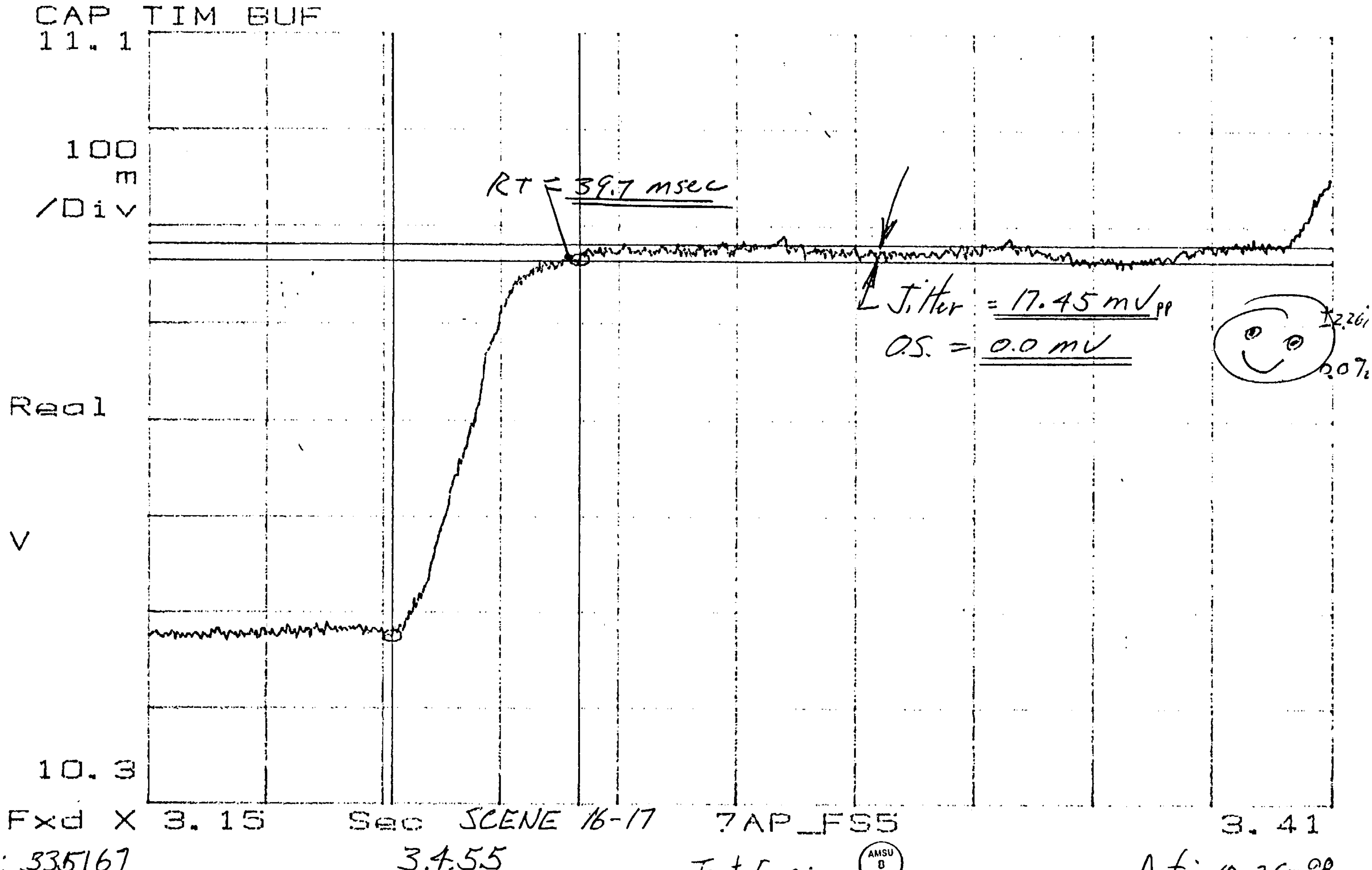
S/O: 335167
P/N: 1331200-2-II SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

BH6

X=3.202 S ΔX=42.19mS Y=10.8823 ΔY=17.45mV
Ya=10.4754 ΔYa=390.9mV

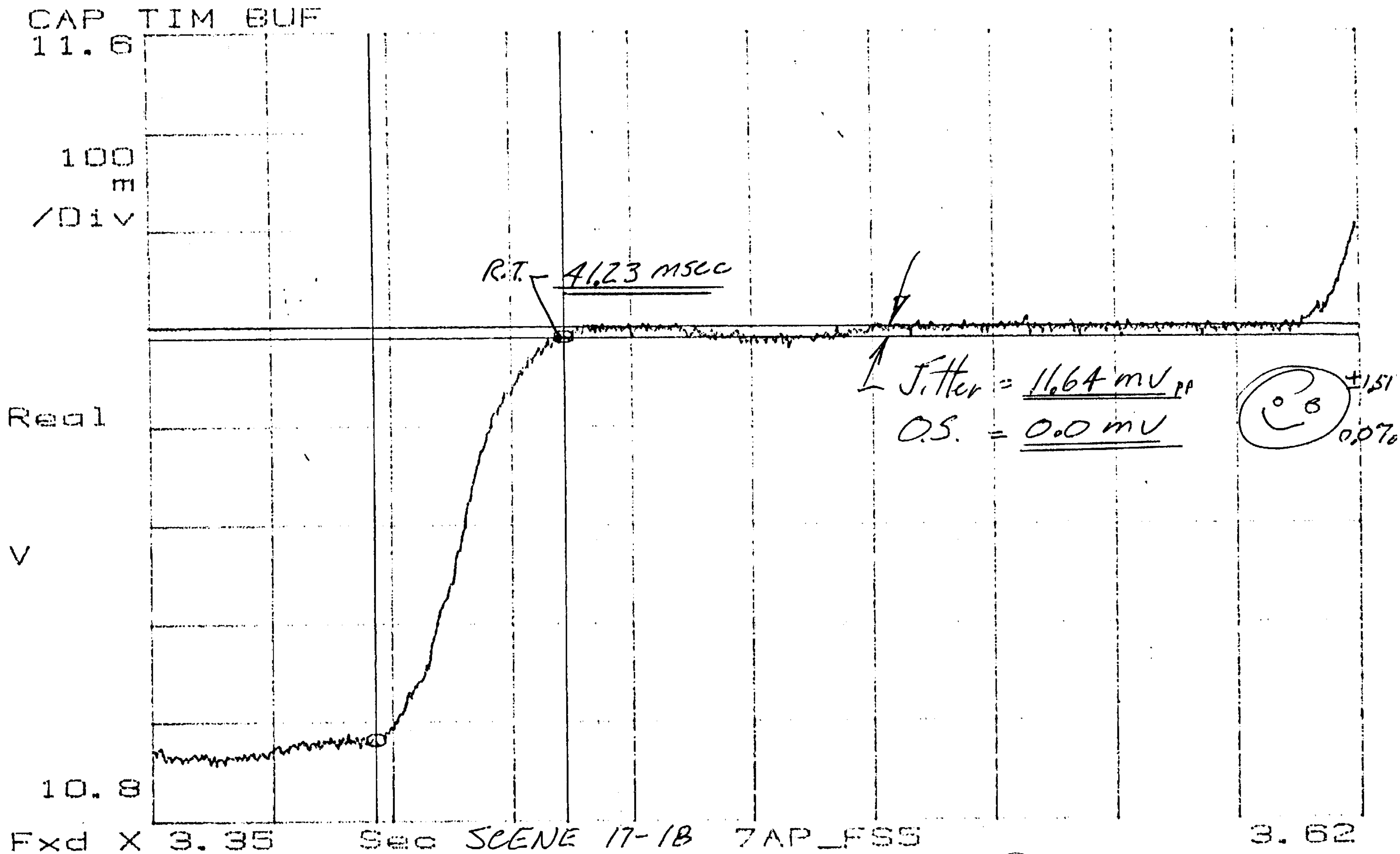


S/O: 335167
P/N: 1331200-2-1T SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B17

X=3.402 S ΔX=42.19mS Y=11.3018 ΔY=11.64mV
Ya=10.8824 ΔYa=408.7mV



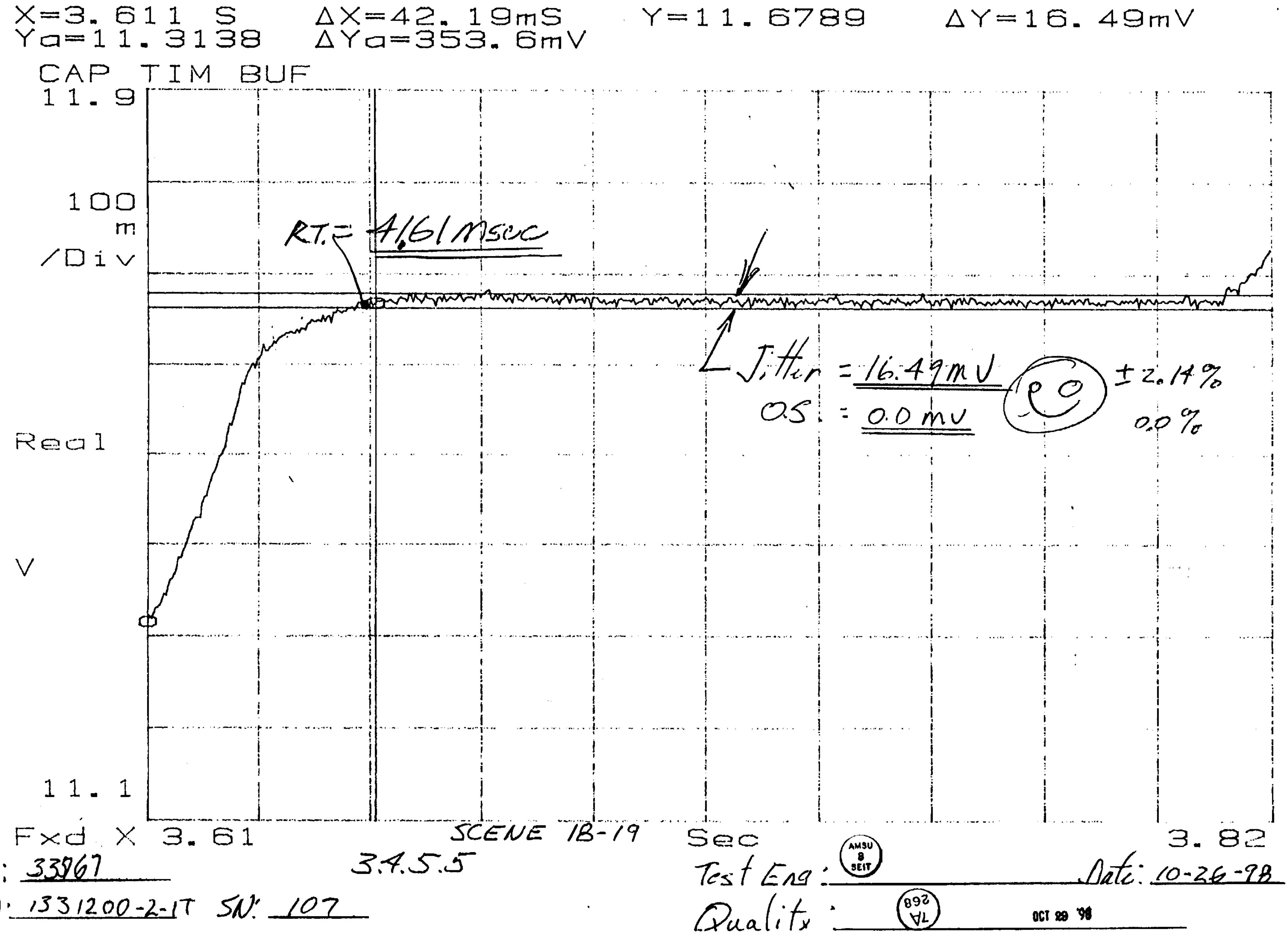
34.55.

S/O: 335167
P/N: 1331200-2-IT SN: 107

Test Eng: AMSU B BEIT Date: 10-26-98

Quality: QA 268 OCT 27 '98

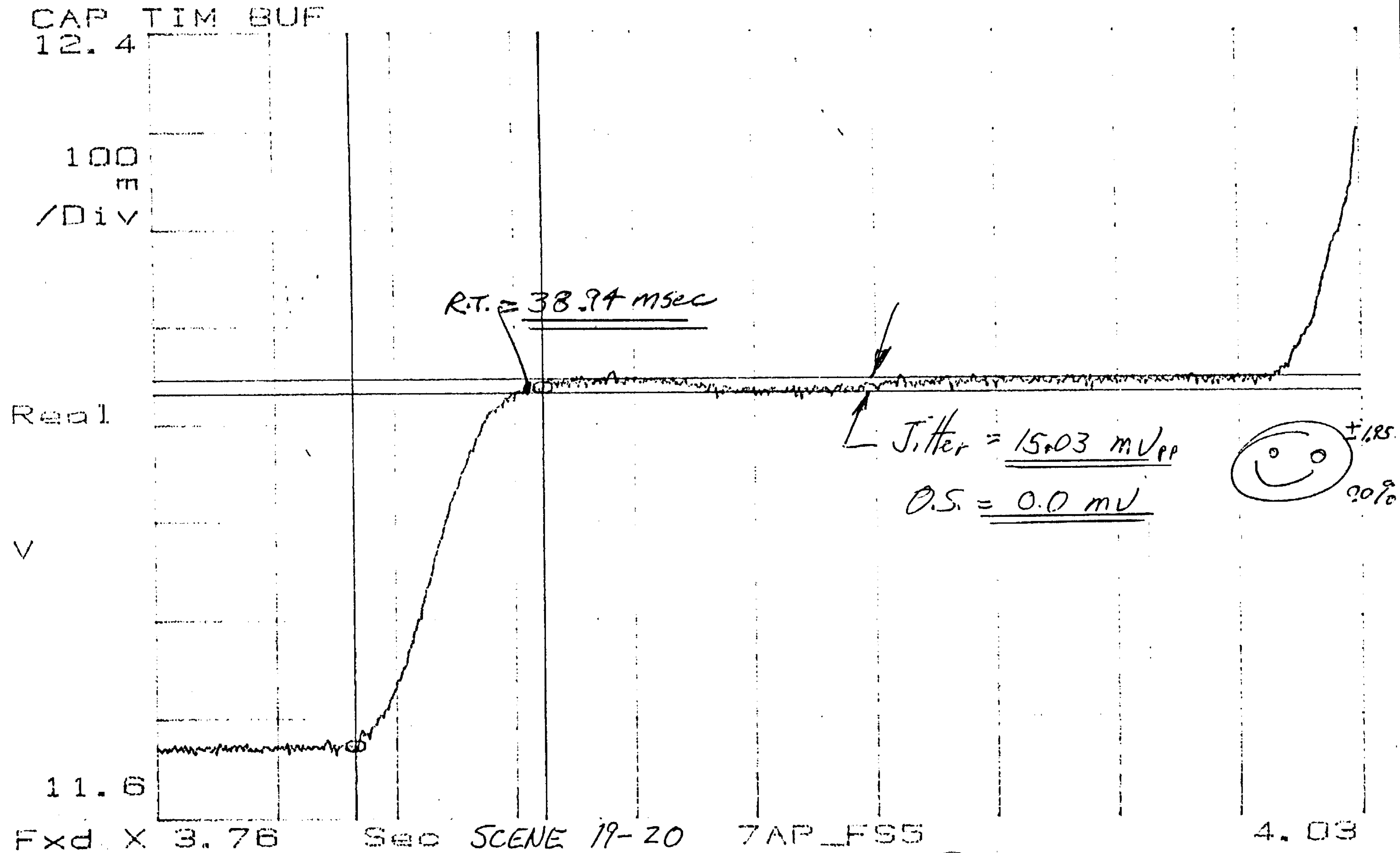
B18



X=3.611 S ΔX=42.19mS Y=11.6789 ΔY=16.49mV
Ya=11.3138 ΔYa=353.6mV
CAP TIM BUF
11.9
100
m
/Div
Real
V
11.1
Fxd X 3.61
Sec
3.82
RT.= 4.61 msec
Jitter = 16.49mV ±2.14%
OS. = 0.0 mv 0.0%
SCENE 1B-19
3.4.5.5
S/O: 33967
P/N: 1331200-2-1T SN: 107
Test Eng:
AMSU B SEIT
Date: 10-26-98
Quality:
TA 268
OCT 29 '98

B19

X=3.808 S ΔX=42.19mS Y=12.0465 ΔY=15.03mV
Ya=11.6723 ΔYa=364.9mV

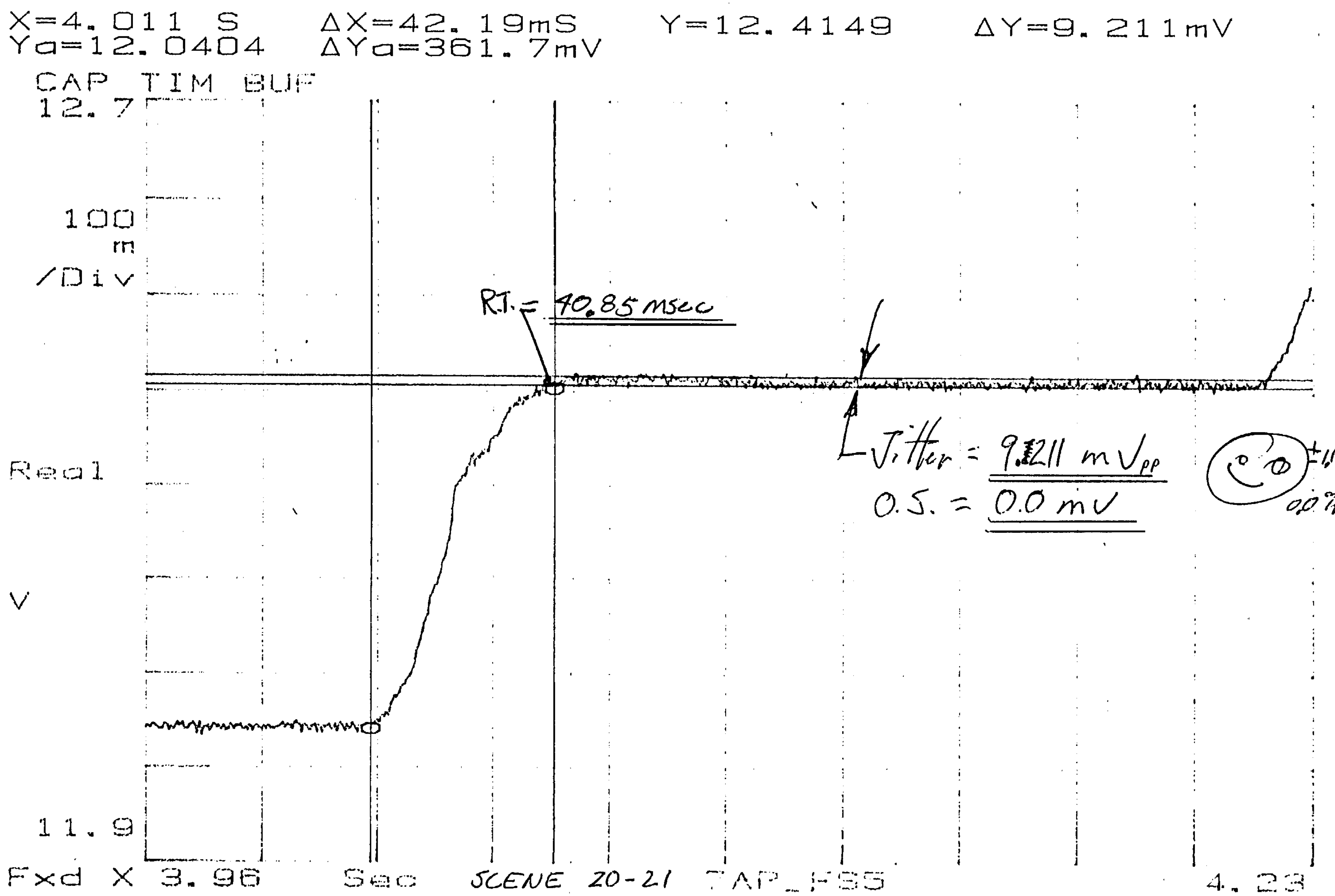


34.55.

S/O: 335167
P/N: 1331200-2-17 SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B20



34.55.

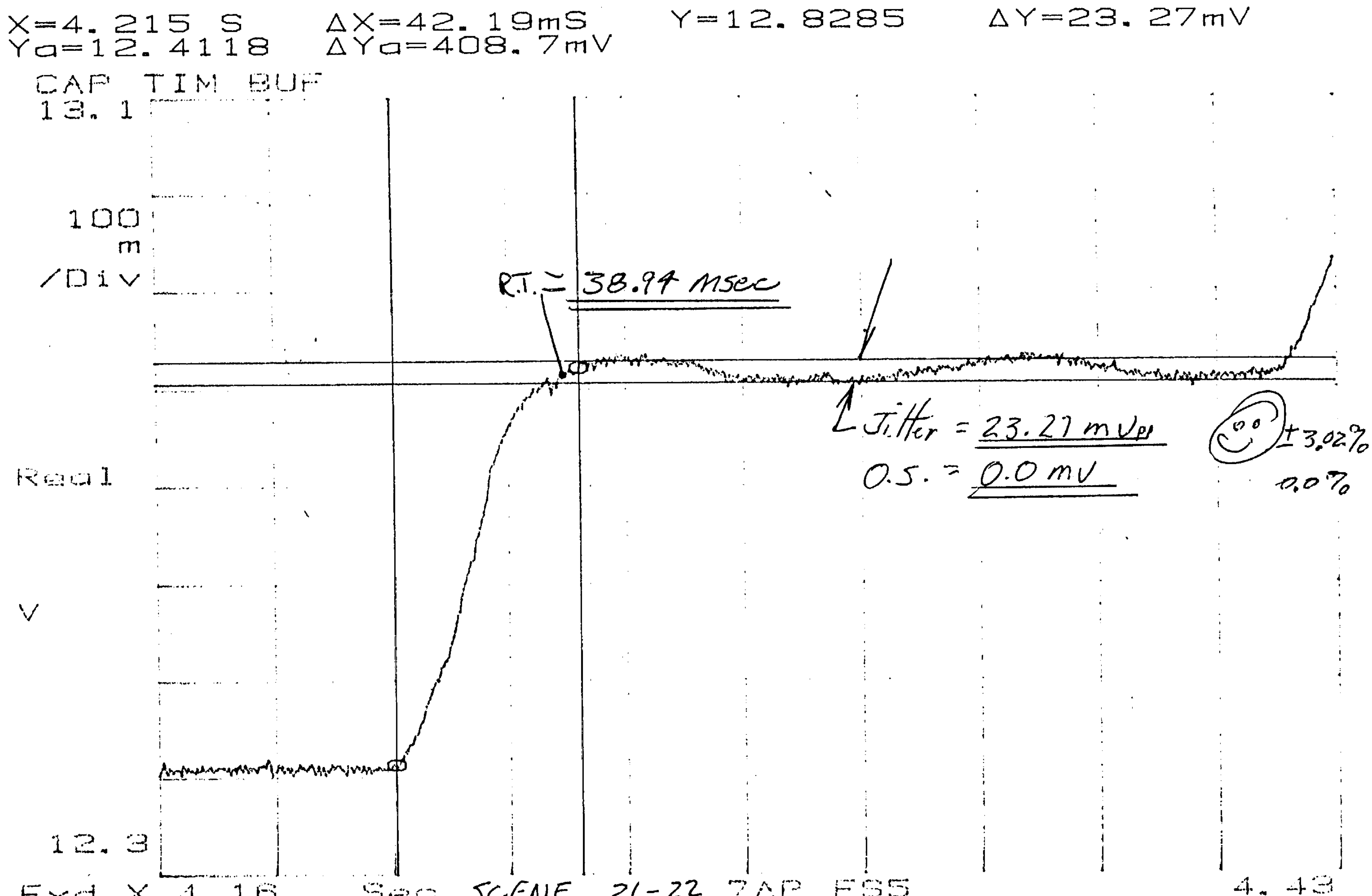
S/O: 335167

P/N: 1331200-2-IT SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B21



3.4.5.5.

S/O: 335167

P/N: 1331200-2-IT SN: 107

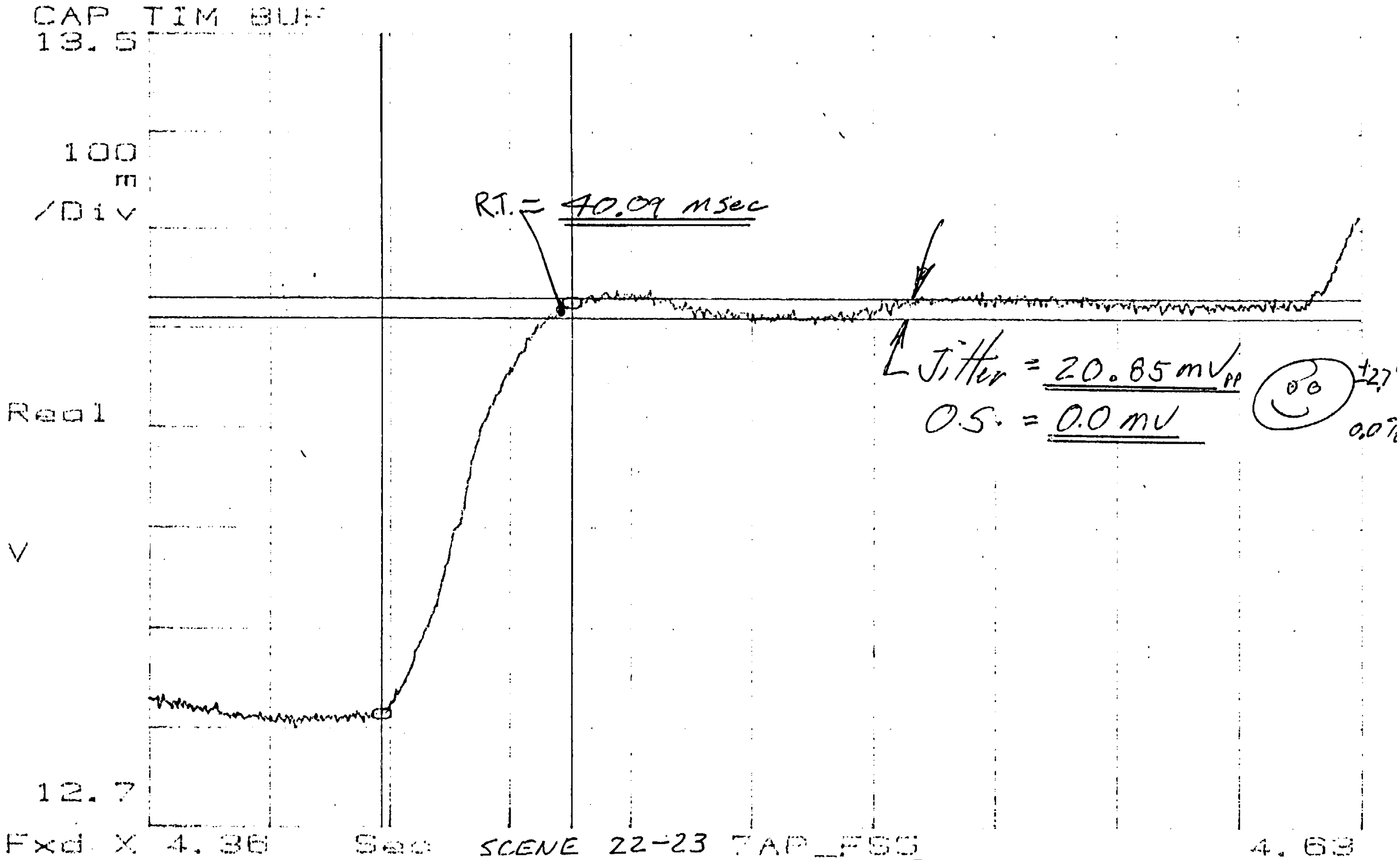
Test Eng: AMSU B SEIT

Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B22

X=4.415 S ΔX=42.19mS Y=13.2299 ΔY=20.85mV
Ya=12.814 ΔYa=410.3mV

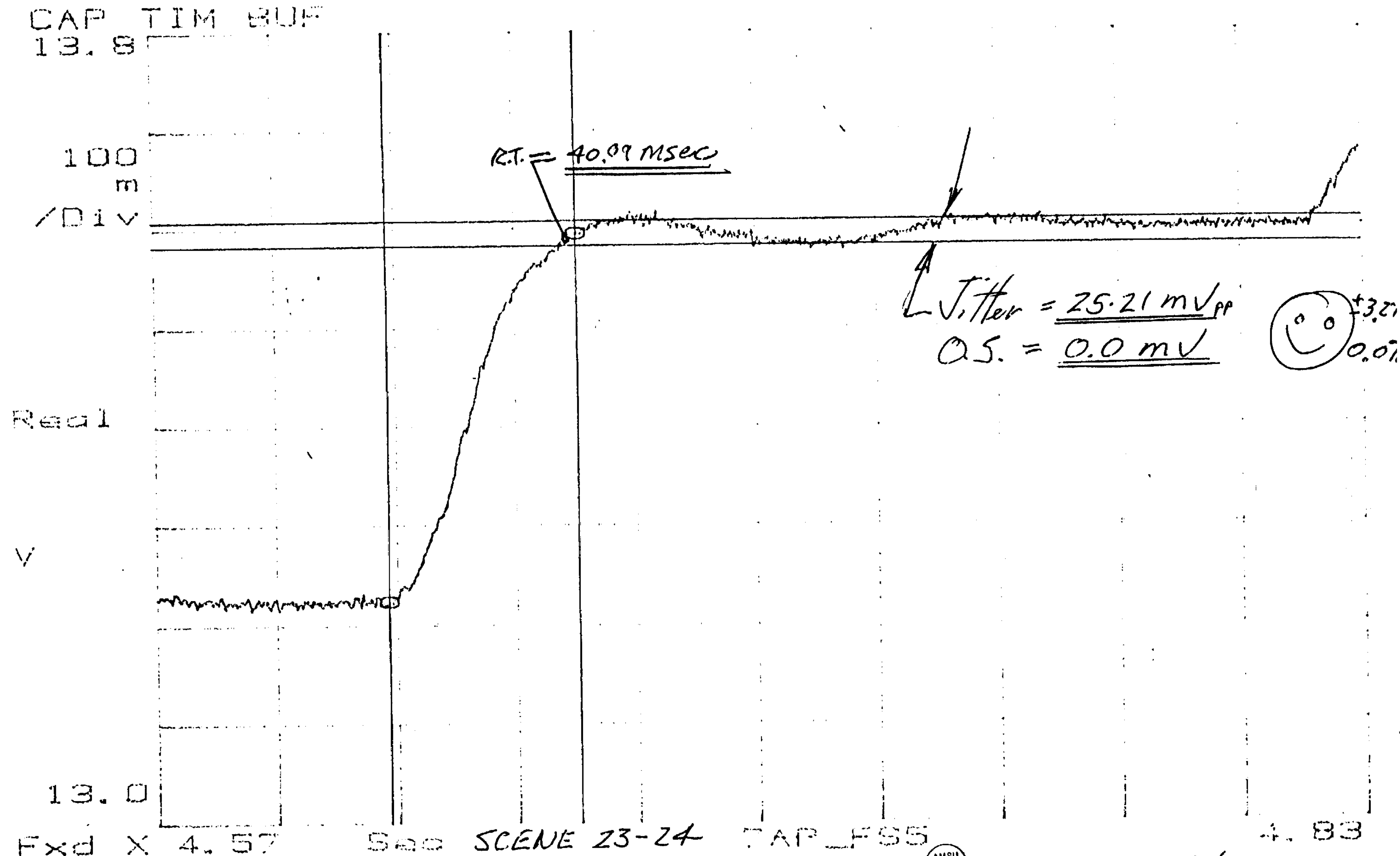


S/O: 335167 3.4.5.5 Test Eng: AMSU 8 SEIT Date: 10-26-98

P/N: 133200-2-IT SN: 107 Quality: 7A 268 OCT 27 '98

B23

X=4.617 S ΔX=42.19mS Y=13.6075 ΔY=25.21mV
Ya=13.2227 ΔYa=371.4mV



3.4.5.5.

S/O: 335167

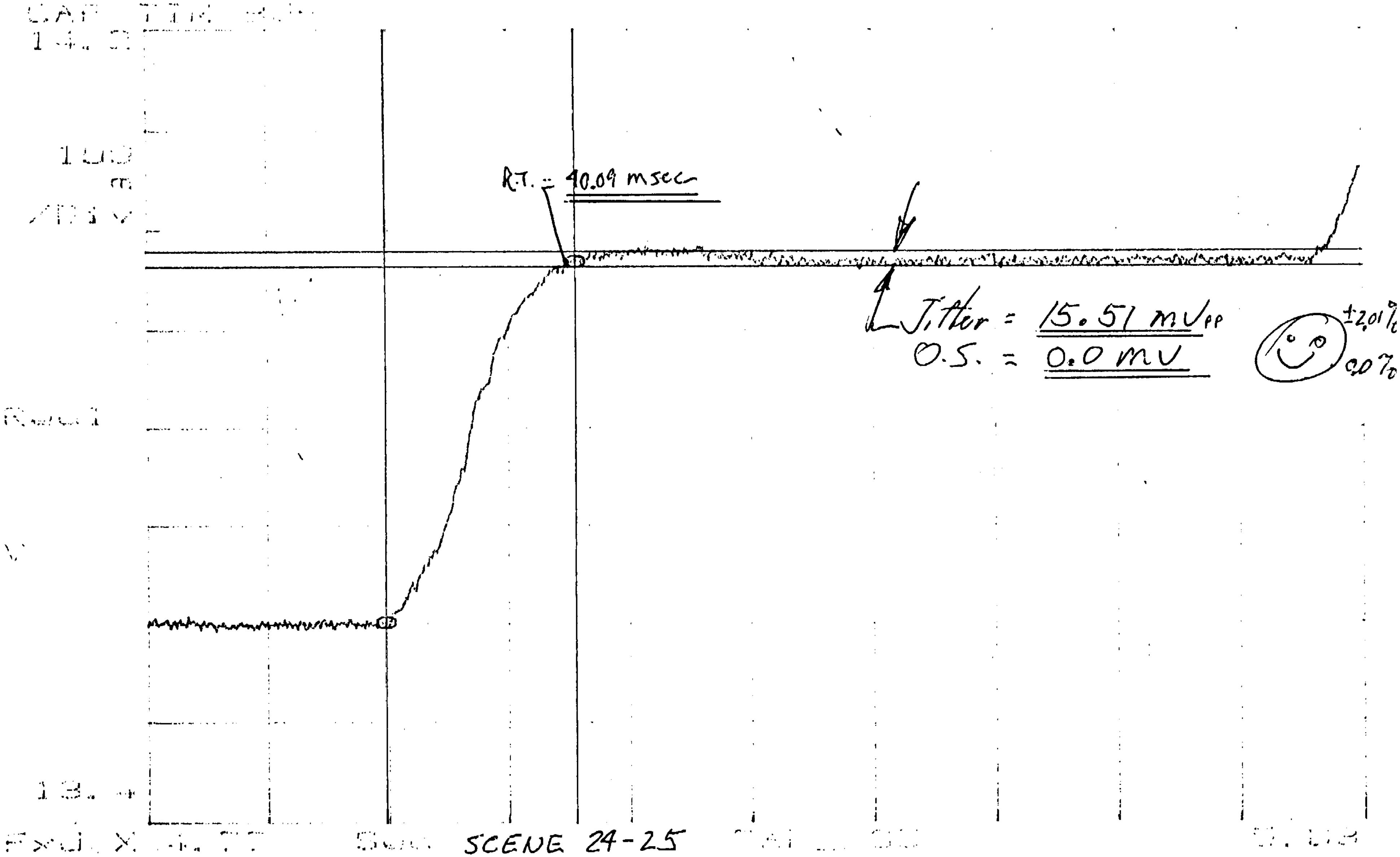
P/N: 1331200-2-IT SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B24

X=4.82 S ΔX=42.19mS Y=13.9794 ΔY=15.51mV
Ya=13.6006 ΔYa=368.2mV



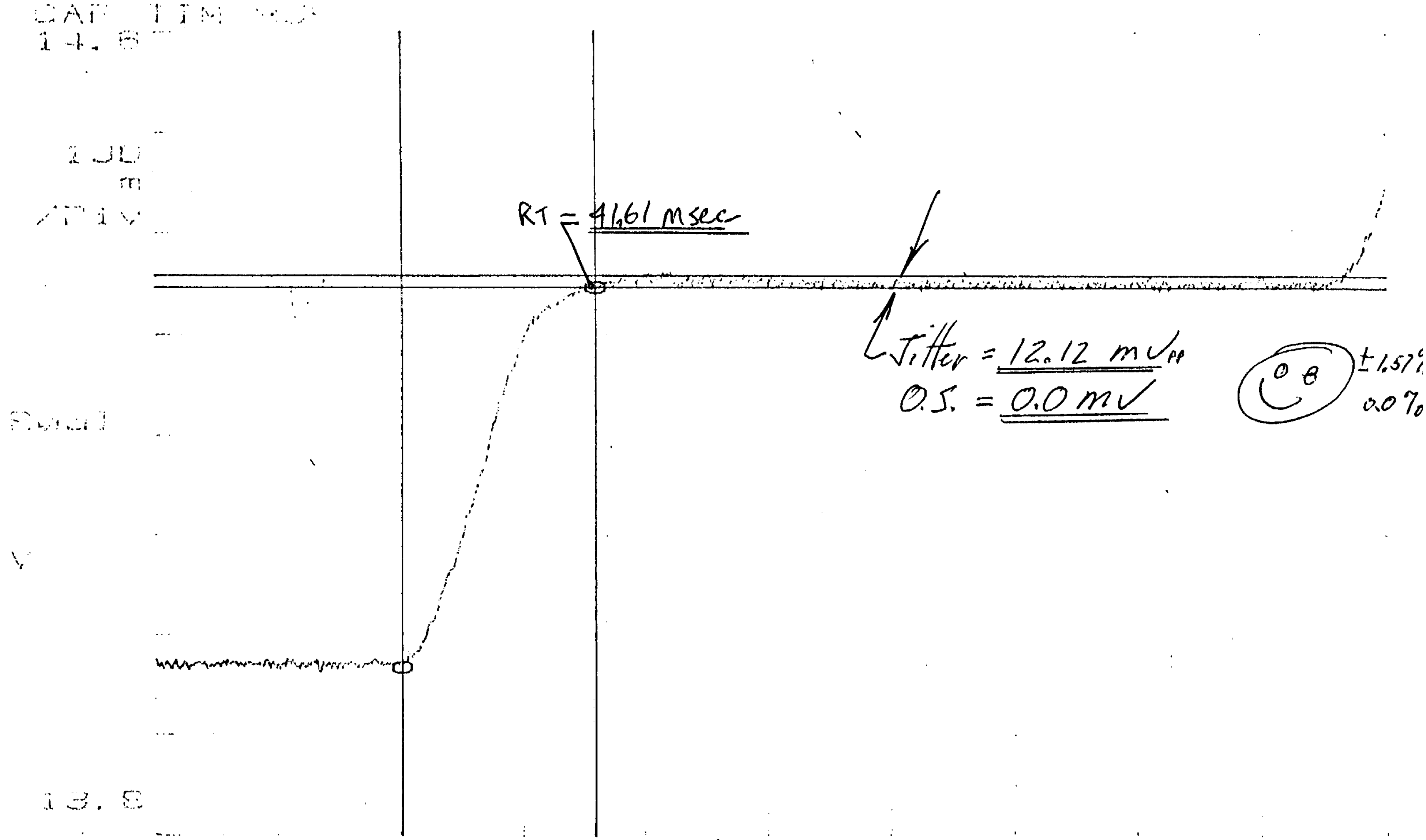
SCENE 24-25
3.4.55.

S/O: 335167
P/N: 1331200-2-IT SN: 107

Test Eng: AMSU B BEIT
Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B25

X=5.023 S ΔX=42.19mS Y=14.3576 ΔY=12.12mV
Ya=13.9655 ΔYa=379.5mV



SCENE 25-26
3.4.5.5

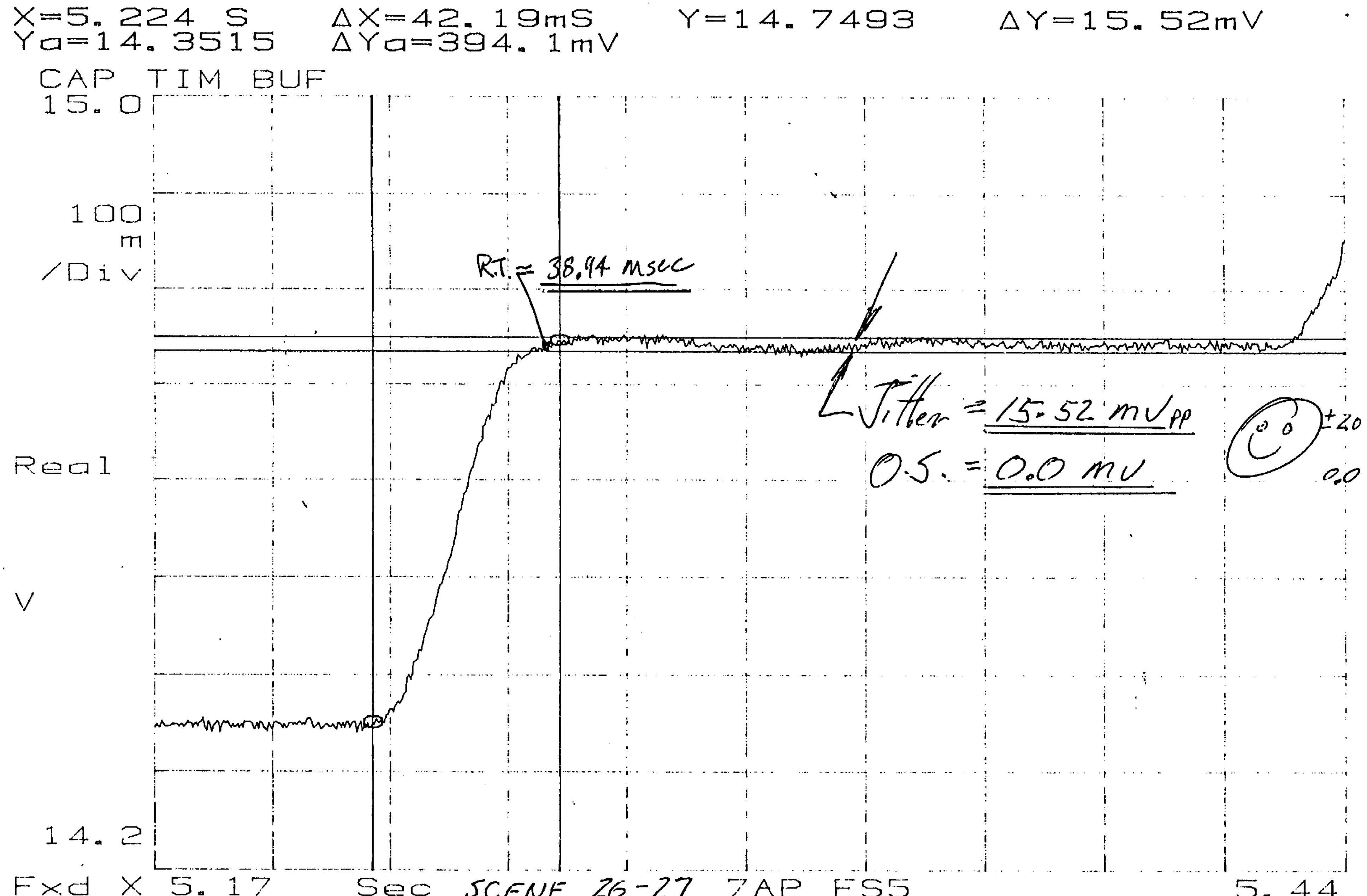
S/O: 335167

P/N: 133200-2-1T SN: 107

Test Eng: AMSU B SEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B26

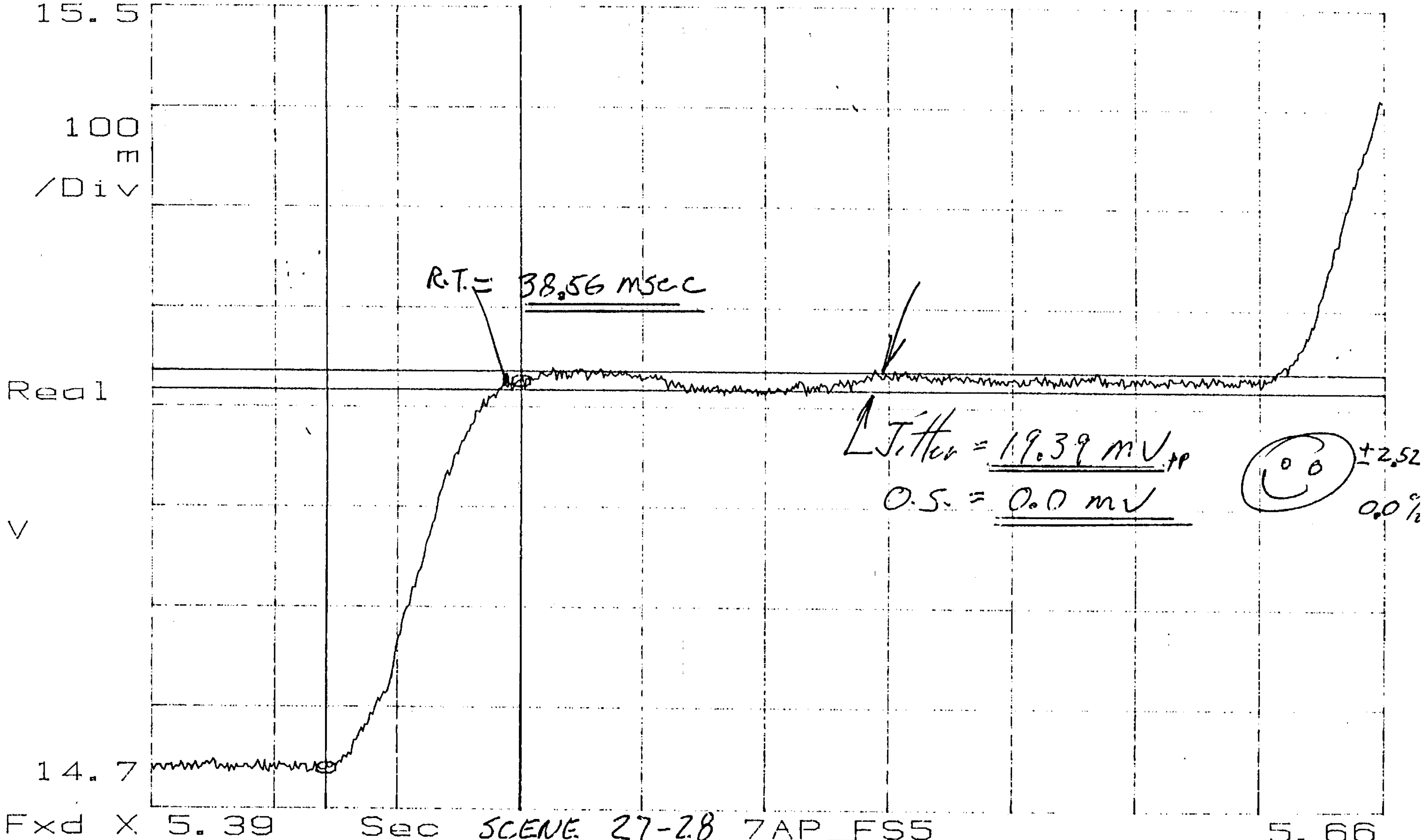


S/O: 335167
P/N: 133/200-2-1T SN: 107
3.4.5.5
Test Eng: AMSU B DEIT
Quality: 7A 268
OCT 27 '98
Date: 10-26-98

B27

X=5.427 S ΔX=42.19mS Y=15.1359 ΔY=19.39mV
Ya=14.7391 ΔYa=386.0mV

CAP TIM BUF

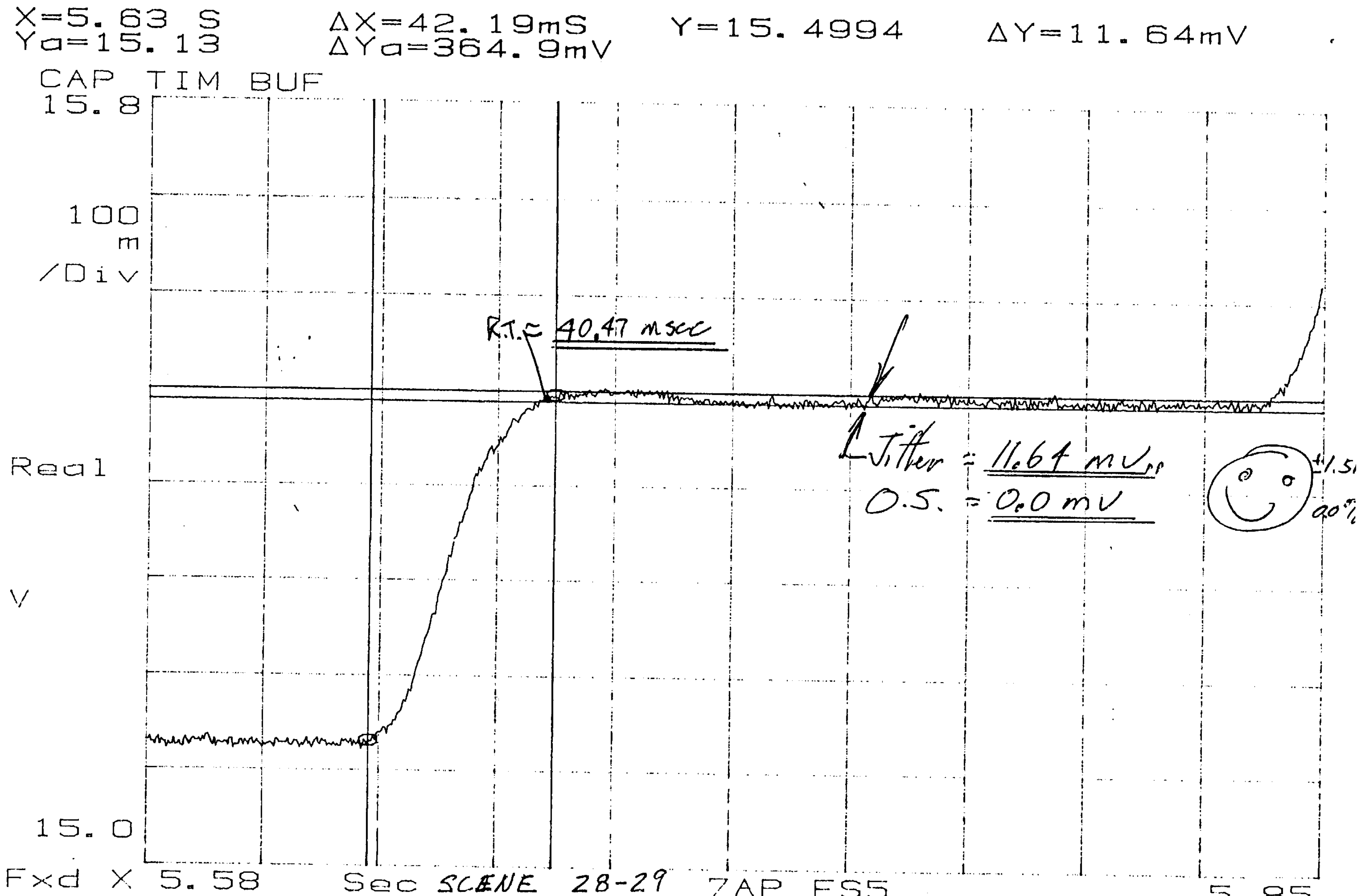


SCENE 27-28 7AP_FS5
3.4.5.5

S/O: 335167
P/N: 133/200-2-1T SN: 107

Test Eng: AMSU 8 SEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B28



SCENE 28-29

34.5.5.

S/O: 335167

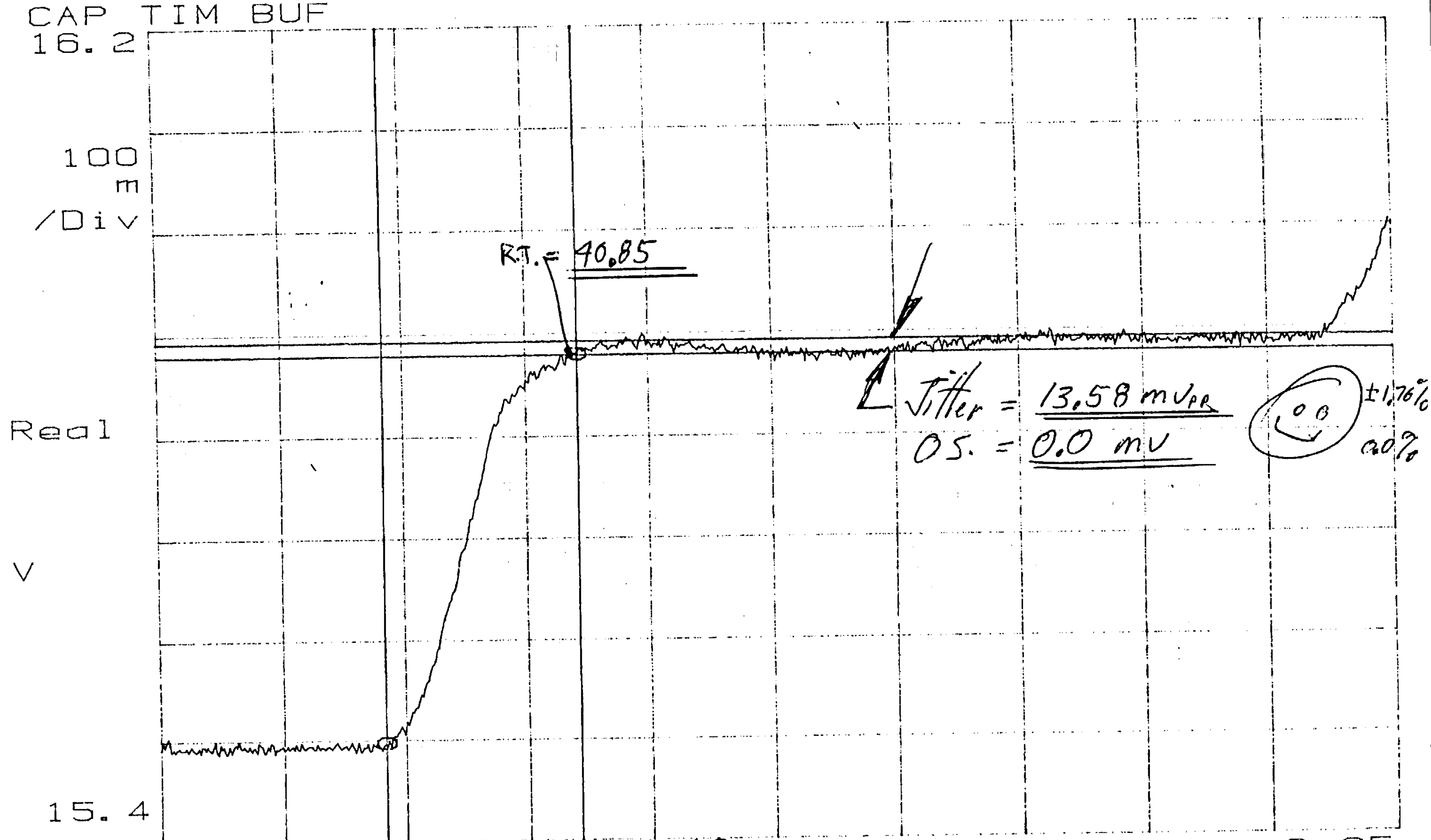
P/N: 1331200-2-1T SN: 107

Test Eng: AMSU 8 BEIT Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B29

X=5.833 S ΔX=42.19mS Y=15.8921 ΔY=13.58mV
Ya=15.4965 ΔYa=382.7mV



SCENE 29-30 7AP_FS5

3.4.5.5

S/O: 33516T

P/N: 133200-2-1T SN: 107

Test Eng: AMSU 8 SEIT

Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B30

X=6.034 S ΔX=210.2mS Y=19.8817 ΔY=34.91mV
Ya=15.8906 ΔYa=4.004 V

CAP TIM BUF

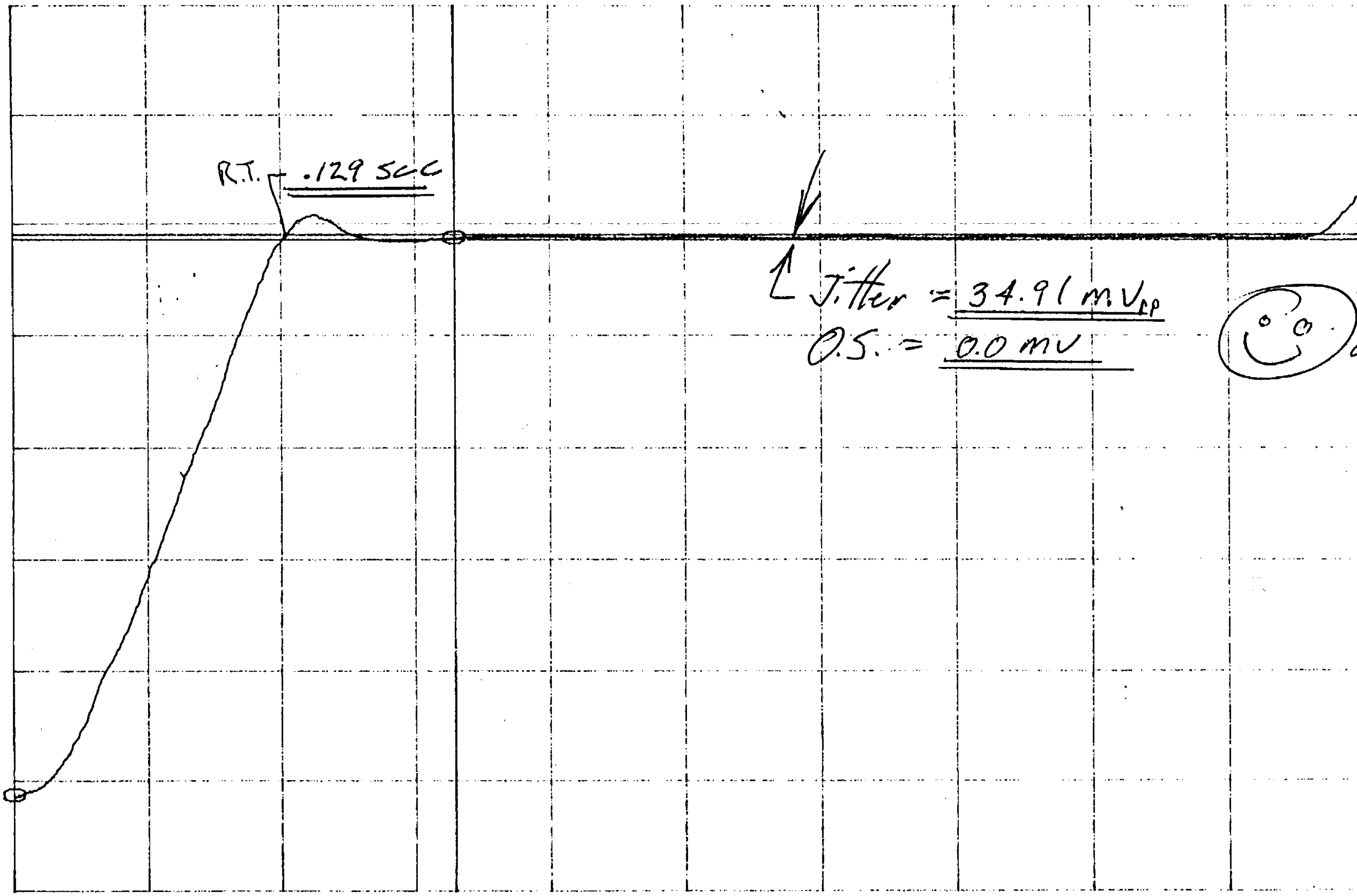
21.6

800 m /Div

Real

V

15.2



Fxd X 6.03 Sec SCENE COLD CAL 7AP_FS5 6.67

S/O: 335167 3.4.5.5

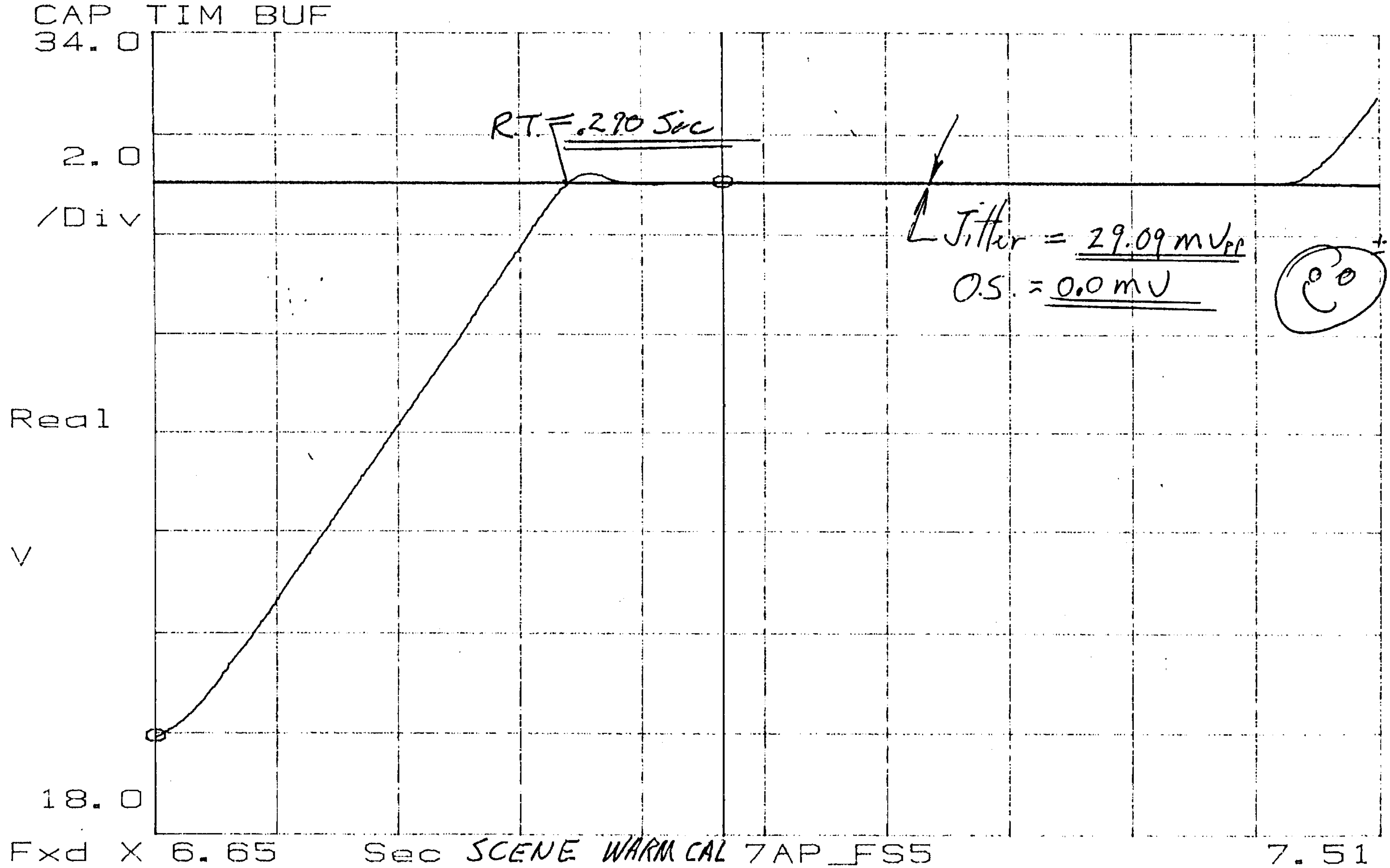
P/N: 1331200-2-IT SN: 107

Test Eng: AMSU B CEIF Date: 10-26-98

Quality: 7A 268 OCT 27 '98

B31

X=6.652 S ΔX=400.8mS Y=31.0327 ΔY=29.09mV
Ya=19.9306 ΔYa=11.11 V



S/O: 335167 3455.
P/N: 133200-2-17 SN: 107
Test Eng: AMSU B SEIT Date: 10-26-98
Quality: 7A 268 OCT 27 '98

B32

TEST DATA SHEET 7 (SHEET 1 OF 4)
3.4.5.5: METSAT Scan Motion and Jitter Test

Test Setup Verified: Ray Hultberg (Signature) Shop Order No. 335167

Step No.	Description	Requirement	Test Result	Pass/Fail
7	--	Stepping Slewing <8 sec period per Figure 25	< 8.0 Sec	P
9	Scene 1-2 3.33° step	<42 msec rise time per Figure 26	38.18 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.319 % 0.0 % 0.5.	P
10	Scene 2-3 3.33° step	<42 msec rise time per Figure 26	40.09 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.62 % 0.0%	P
11	Scene 3-4 3.33° step	<42 msec rise time per Figure 26	41.23 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.58% 0.0 %	P
12	Scene 4-5 3.33° step	<42 msec rise time per Figure 26	38.56 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.67 % 0.0 %	P
13	Scene 5-6 3.33° step	<42 msec rise time per Figure 26	40.09 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.52% 0.0 %	P
14	Scene 6-7 3.33° step	<42 msec rise time per Figure 26	41.67 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.87 % 0.0 %	P
15	Scene 7-8 3.33° step	<42 msec rise time per Figure 26	41.67 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.56 % 0.0 %	P
16	Scene 8-9 3.33° step	<42 msec rise time per Figure 26	41.67 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.158% 0.0 %	P

Pass = P
Fail = F

B33 a

TEST DATA SHEET 7 (SHEET 2 OF 4)
3.4.5.5: METSAT Scan Motion and Jitter Test

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<42 msec rise time per Figure 26	41.61 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.7 % 0.0 %	P
18	Scene 10-11 3.33° step	<42 msec rise time per Figure 26	39.32 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.12 % 0.0 %	P
19	Scene 11-12 3.33° step	<42 msec rise time per Figure 26	41.23 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.76 % 0.0 %	P
20	Scene 12-13 3.33° step	<42 msec rise time per Figure 26	38.94 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.76 % 0.0 %	P
21	Scene 13-14 3.33° step	<42 msec rise time per Figure 26	39.70 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.46 % 0.0 %	P
22	Scene 14-15 3.33° step	<42 msec rise time per Figure 26	39.32 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.02 % 0.0 %	P
23	Scene 15-16 3.33° step	<42 msec rise time per Figure 26	37.8 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.57 % 0.0 %	P
24	Scene 16-17 3.33° step	<42 msec rise time per Figure 26	39.7 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.26 % 0.0 %	P

Pass = P
Fail = F

B336

TEST DATA SHEET 7 (SHEET 3 OF 4)
3.4.5.5: METSAT Scan Motion and Jitter Test

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<42 msec rise time per Figure 26	41.23 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.51 % 0.0 %	P
26	Scene 18-19 3.33° step	<42 msec rise time per Figure 26	41.61 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.14 % 0.0 %	P
27	Scene 19-20 3.33° step	<42 msec rise time per Figure 26	38.94 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.85 % 0.0 %	P
28	Scene 20-21 3.33° step	<42 msec rise time per Figure 26	40.85 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.19 % 0.0 %	P
29	Scene 21-22 3.33° step	<42 msec rise time per Figure 26	38.94 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 3.02 % 0.0 %	P
30	Scene 22-23 3.33° step	<42 msec rise time per Figure 26	40.09 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.7 % 0.0 %	P
31	Scene 23-24 3.33° step	<42 msec rise time per Figure 26	40.09 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	+ 3.27 % 0.0 %	P
32	Scene 24-25 3.33° step	<42 msec rise time per Figure 26	40.09 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.01 % 0.0 %	P

Pass = P
Fail = F

B33c

TEST DATA SHEET 7 (SHEET 4 OF 4)
3.4.5.5: METSAT Scan Motion and Jitter Test

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<42 msec rise time per Figure 26	41.61 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.57 % 0.0 %	P
34	Scene 26-27 3.33° step	<42 msec rise time per Figure 26	38.94 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.01 % 0.0 %	P
35	Scene 27-28 3.33° step	<42 msec rise time per Figure 26	38.56 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 2.52 % 0.0 %	P
36	Scene 28-29 3.33° step	<42 msec rise time per Figure 26	40.47 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.51 % 0.0 %	P
37	Scene 29-30 3.33° step	<42 msec rise time per Figure 26	40.85 msec	P
		< ±5% jitter per Figure 26 < +4% overshoot for 19 msec	± 1.76 % 0.0 %	P
38	Scene 30-Cold Cal 35.0° slew	<0.21 sec slew time per Figure 29	0.129 sec	P
		< ±5% jitter per Figure 30	±4.53 %	P
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure 31	0.290 sec	P
		< ±5% jitter per Figure 32	± 3.78 %	P

Pass = P
Fail = F

Unit: 1331200-2-1T

Test Engineer: AMSU B SEIT

Serial No.: 107

Quality Assurance: TA 268 OCT 29 '98

Date: Oct 27, 1998

Customer Representative: JAN 21 '99

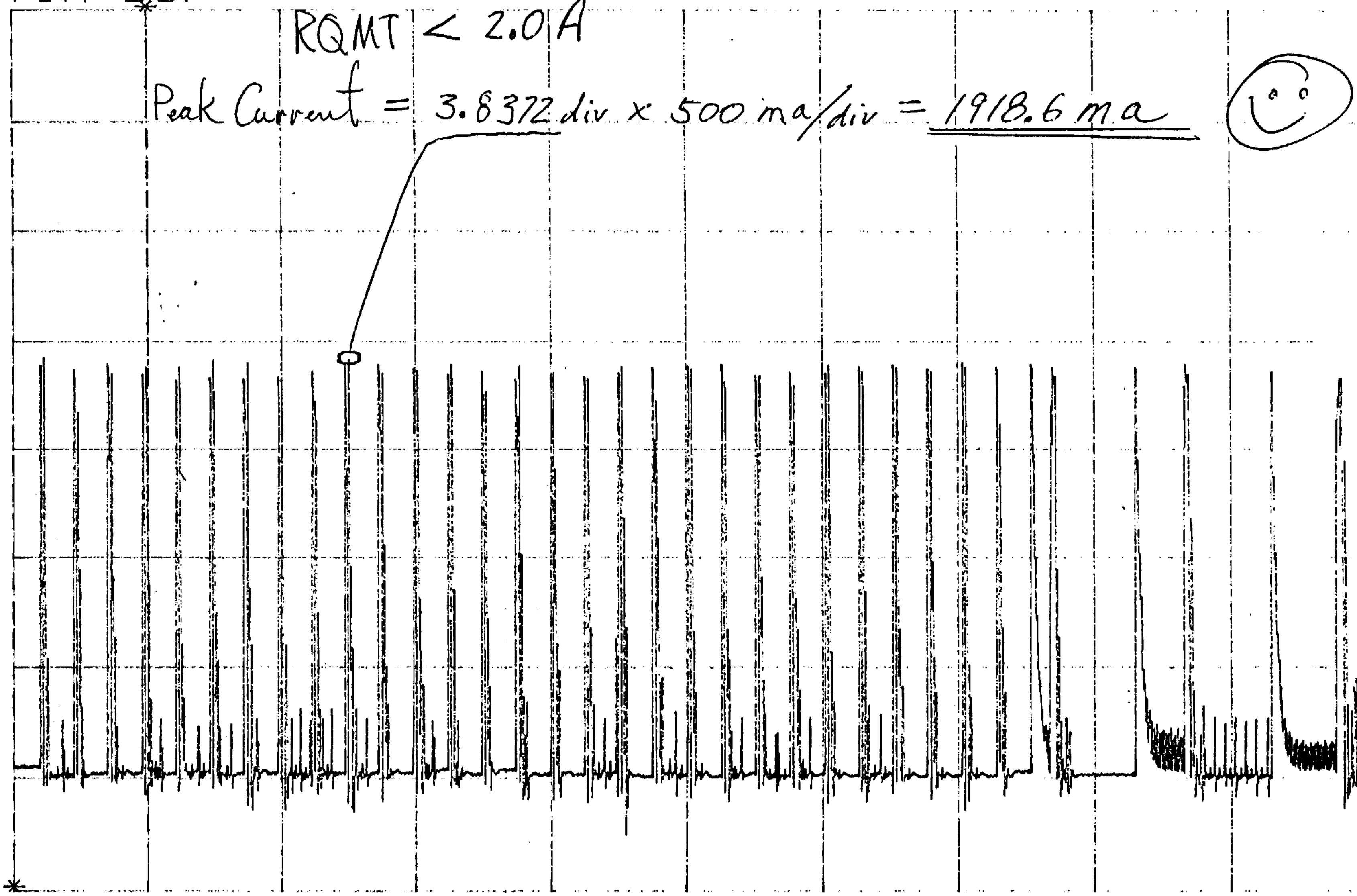
Appendix C

Pulse Load Current Waveforms DSA Plots and Test Data Sheet

X=2.0129 Sec
Ya=38.3728mV
CAP TIM BUF

RQMT < 2.0A

Peak Current = 3.8372 div x 500 ma/div = 1918.6 ma



S/O: 335167 3.4.5.6

P/N: 1331200-2-1T SN: 107

Test Eng: AMSU 8 SEIT

Quality: 7A 268 OCT 27 '98

Date: 10-26-98

C1

TEST DATA SHEET 8
3.4.5.6: METSAT Pulse Load Bus Current

Test Setup Verified: Ray Hufford
Signature

Shop Order No. 335167

3.4.5.6: 28V Bus Peak Current and Rise Time Test

Step No.	Requirement	Test Result	Pass/Fail
4	< 2 A peak any place in the scan	1918.6ma	P
5	> 70 μsec rise time, 3.33° step	1.562 msec	P
6	> 70 μsec rise time, start of WC slew	1.953 msec	P
6	> 70 μsec rise time, end of WC slew	4.29 msec	P

Pass = P
Fail = F

Unit: 1331200-2-IT

Serial No.: 107

Test Engineer: AMSU 8 SEIT

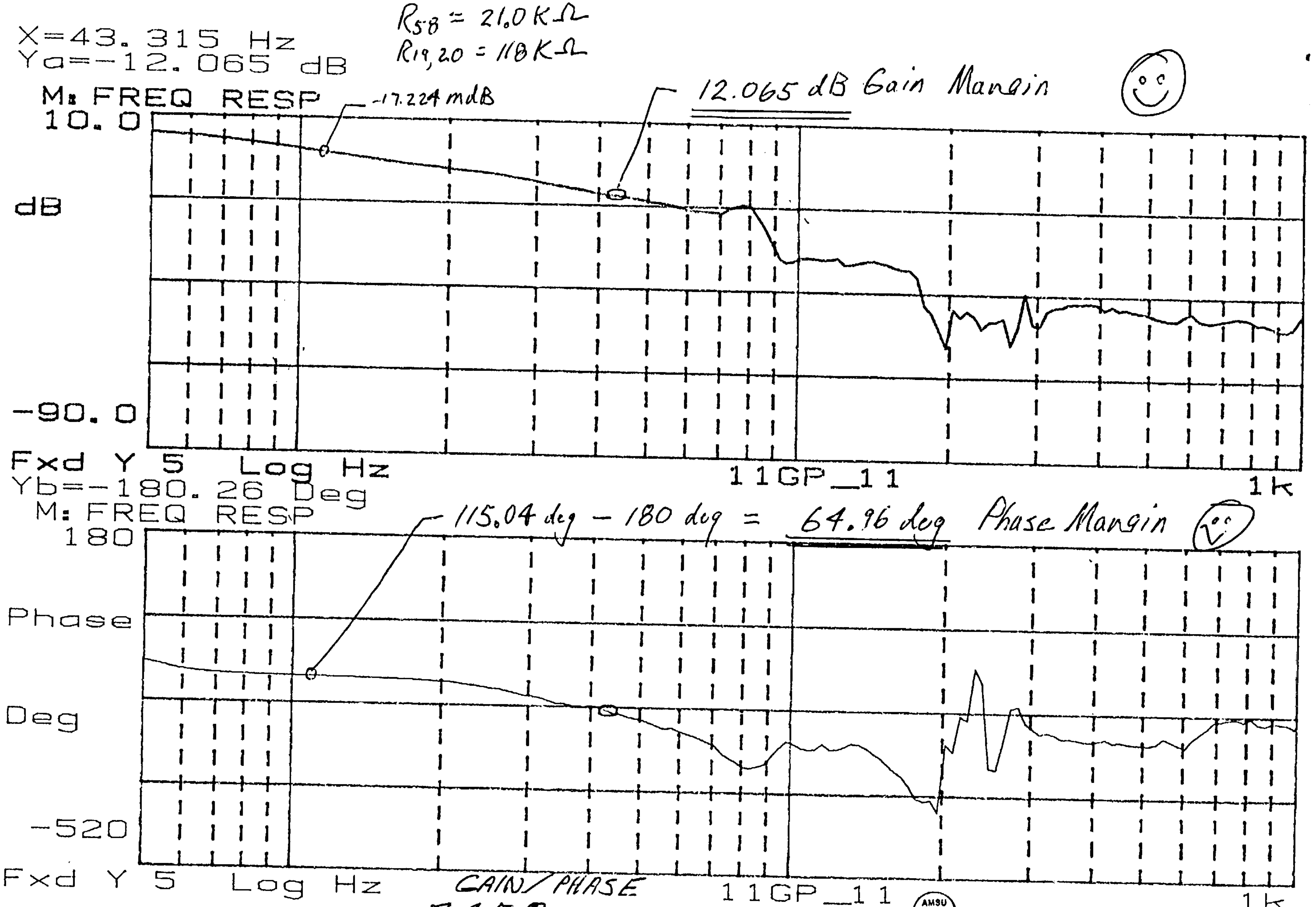
Quality Assurance: 7A 263 OCT 29 '98

Date: OCT 29 '98

C2

Appendix D

Gain and Phase Margin Test Data Sheet



S/O: 335167

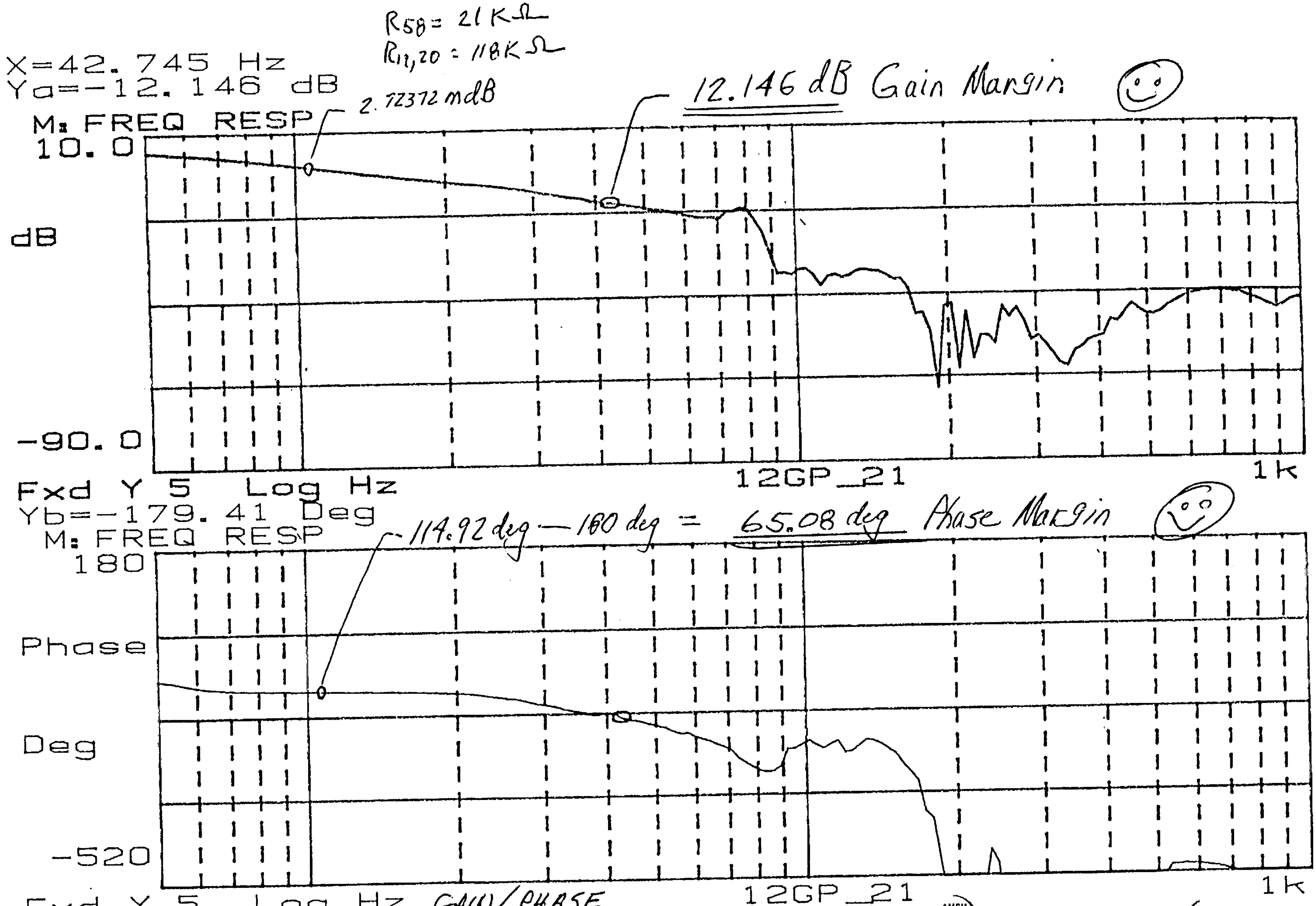
P/N: 1331200-2-1T SN: 107

AMSU B SEIT

Test Eng. ______ Date: 10-22-98

Quality: ______ 7A 268 OCT 22 '98

D1



GAIN/PHASE
3.4.5.B.

S/O: 335167

P/N: 1331200-2-1T SN: 107

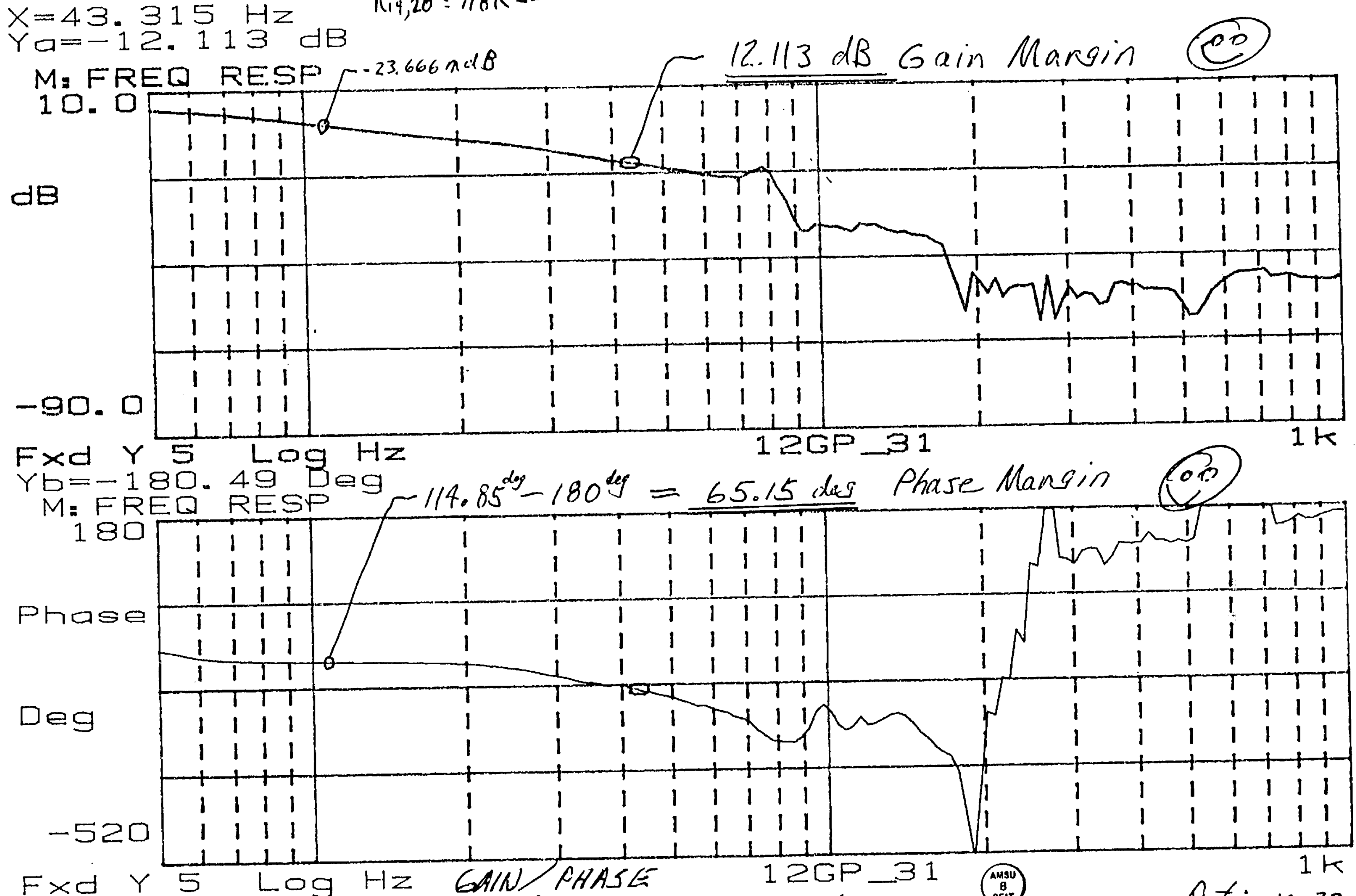
Test Eng: AMSU 8 SEIT

Date: 10-22-98

Quality: 7A 268 OCT 22 '98

D2

$R_{56} = 21K\Omega$
$R_{19,20} = 118K\Omega$



GAIN/PHASE
3.4.5.8.

AMSU B SEIT

S/O: 335167

P/N: 1331200-2-1T SN: 107

Test Eng: ______ Date: 10-22-96

Quality: ______

7A 268 OCT 23 '98

D3

TEST DATA SHEET 9
3.4.5.8: METSAT Gain/Phase Margin Test

Test Setup Verified: Ray Hubberg
Signature

Shop Order No. 335167

3.4.5.8 Step 12: Gain/Phase Margin Test

Requirement	Test Result		Pass/Fail
12 dB minimum	1	12.065 dB	P
	2	12.146 dB	
	3	12.113 dB	
25 degrees minimum	1	64.96 deg	P
	2	65.08 deg	
	3	65.15 deg	

Pass = P
Fail = F

Unit: 1331200-2-IT

Serial No.: 107

Date: 10-27-98

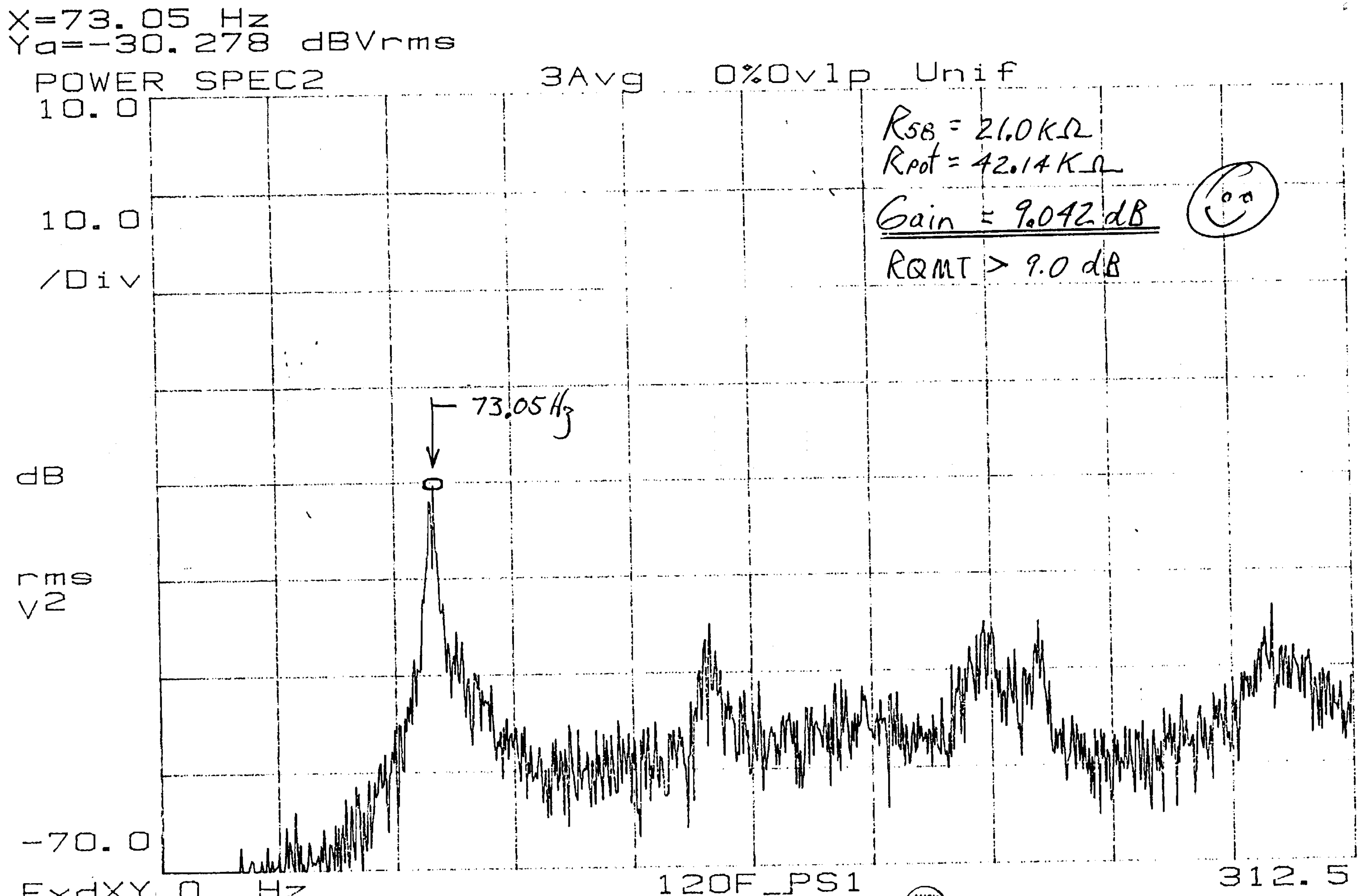
Test Engineer: AMSU 8 SEIT

Quality Assurance: 7A 268 OCT 29 '98

Customer Representative:

Appendix E

Operational Gain Margin Power Spectrum DSA Plots and Test Data Sheet



S/O: 335167 3.4.5.9

P/N: 133I200-2-IT SN: 107

Test Eng: Date: 10-26-9

Quality: OCT 27 '98

E1

TEST DATA SHEET 10
3.4.5.9: METSAT Operational Gain Margin Test

Test Setup Verified: [signature] Signature   Shop Order No. 335167

3.4.5.9: Operation Gain Margin Test

Step No.	Requirement		Test Result	Pass/Fail
	R58 Resistance (Kohms)			
11	Test Pot Resistance (Kohms)	1	42.14 KΩ	P
		2	43.06 KΩ	
		3	42.26 KΩ	
12	Oscillation Frequency (Hz)	1	73.05 Hz	P
		2	73.05 Hz	
		3	73.05 Hz	
16	Gain Margin, 9 dB minimum	1	9.042 dB	P
		2	9.16 dB	
		3	9.05 dB	

Pass = P
Fail = F

Unit: 1331200-2-1T

Serial No.: 107

Test Engineer: AMSU 8 SEIT

Quality Assurance: 893 TA OCT 29 '98

Date: 10-27-98

E2

NASA

National Aeronautics and Space Administration

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
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4. Title and Subtitle Integrated Advanced Microwave Sounding Unit-A (AMSU-A), Performance Verification Report	5. Report Date December 1998
	6. Performing Organization Code ---
7. Author(s) T. Higgins	8. Performing Organization Report No. 11369
	10. Work Unit No. ---
9. Performing Organization Name and Address Aerojet 1100 W. Hollyvale Azusa, CA 91702	11. Contract or Grant No. NAS 5-32314
12. Sponsoring Agency Name and Address NASA Goddard Space Flight Center Greenbelt, Maryland 20771	13. Type of Report and Period Covered Final
	14. Sponsoring Agency Code ---

15. Supplementary Notes

---

16. ABSTRACT (*Maximum 200 words*)

This is the Performance Verification Report, METSAT AMSU0A2 Antenna Drive Subsystem, P/N 1331200-2, S/N 107, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).

17. Key Words (Suggested by Author(s))	18. Distribution Statement
EOS Microwave System	Unclassified — Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price
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NASA FORM 1626 OCT 86

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6. AUTHOR(S) T. Higgins			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Aerojet 1100 W. Hollyvale Azusa, CA 91702		8. PERFORMING ORGANIZATION REPORT NUMBER 11369 December 1998	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) NASA Goddard Space Flight Center Greenbelt, Maryland 20771		10. SPONSORING/MONITORING AGENCY REPORT NUMBER ---	
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6. AUTHOR(S)
T. Higgins

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS (ES)
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1100 W. Hollyvale
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